REMEDIAL PLANNING ACTIVITIES AT SELECTED UNCONTROLLED HAZARDOUS SUBSTANCE DISPOSAL SITES IN THE ZONE OF REGIONS VI, VII, AND VIII

U. S. EPA CONTRACT NO. 68-W9-0032

FIELD SAMPLING PLAN

MOUND STREET PCB SITE
ST. LOUIS, MISSOURI

Work Assignment No.: 37-7JZZ

January 23, 1996

Prepared for:
U.S. Environmental Protection Agency

Prepared by:
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1.0 INTRODUCTION

Under authority of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA), Sverdrup Corporation, Inc. (Sverdrup), under authorization from the U. S. Environmental Protection Agency (EPA) Region VII, will conduct a Screening Site Inspection (SSI) at the Mound Street PCB Site located at 100 Mound Street in St. Louis, Missouri. The scope of the investigation will include the collection of groundwater and subsurface soil samples to assess the level of contamination at the site. Development of this Field Sampling Plan (FSP) was completed in accordance with requirements outlined in EPA 540-R-92-021, "Guidance for Performing Site Investigations Under CERCLA" dated September 1992.

2.0 SITE DESCRIPTION

2.1 SITE LOCATION

The Mound Street PCB Site is located in the City of St. Louis at the eastern end of Mound Street (near the intersection of Mound Street and First Street) (Figure 1). The site is on the western side of the concrete flood wall. The geographic coordinates of the site are 38° 38' 34.0" north latitude and 90° 10' 57.2" west longitude (Falls 1993b). The site can be reached by traveling north on Broadway from Interstate 64 or south on Broadway from the Salisbury Street exit off Interstate 70. From Broadway take Mullanphy Street east, and turn left onto a gravel roadway just past the Apex Oil facility on the left. Take the gravel roadway north to Mound Street. The site is encompassed by Mound Street, the gravel roadway, and the Petroleum, Fuel and Terminal-Apex Oil facility (Apex Oil).

2.2 SITE DESCRIPTION/HISTORY

The total area of the site is estimated at approximately 1.5 acres (MDNR 1994a, Sverdrup 1995a & b). The buildings on the site were demolished in 1991, and the property currently has no structures upon it. The property is owned by McKinley Iron, Inc. located at 3620 North Hall Street, St. Louis, Missouri. Mr. Herman Gellman, representative of McKinley Iron, was present during a portion of the site reconnaissance activities conducted at the site on December 6, 1995. Mr Gellman did not know if the basement walls and floor were removed during building demolition. He did state that the basement area was filled with demolition debris. He was not aware of any unusual observation made, such as stained soil, during the building demolition. He estimated the basement depth to be between 12 and 14 feet. Mr. Gellman stated the property was originally purchased from Union Electric to salvage power plant equipment.

The site is roughly rectangular in shape and is bordered on three sides by industrial property (Figure 2). Gravel roads are located along the property perimeter, with Mound Street being the northern boundary. An east-west path has been made which splits the property. No fencing or other barrier exists around the property. Bricks, rock, wood, metal, brush, and concrete debris are located on the southern portion of the property. Several small soil piles were observed along the southeastern edge of the property. Two 55-gallon drums were also observed adjacent to the debris. No visible markings were noted on the drums and no attempt was made to open them. The northern portion is overgrown with grass and weeds. Exposed soil, approximately four feet square, was observed on the northern portion of the property. The general surface runoff is toward the east and south. Toward the east is vacant property with railroad tracks, a concrete flood wall, and then the Mississippi River (Sverdrup 1995a & b).

The Metropolitan Sewer District, Brooklyn Street pump station is located approximately 575 feet north-northeast of the site. The pump station is located on the west side of the flood wall. Two wells sampled in 1991 by E&E/FIT and three manholes sampled by MSD in 1993 were identified (Figure 2). An abandoned pump house, once part of the Mound Street Power Plant, is located on the east side of the flood wall. The abandoned pump house is in poor condition. At the time of the site reconnaissance visit, the water level of the Mississippi River was at the bottom of the pump house. According to Mr. Gellman, the property occupied by the abandoned pump house was deeded to the City of St. Louis for construction of a bike path along the river (Sverdrup 1995a &b).

The St. Louis climate is characterized as having cold winters and long hot summers (USDA 1982). Rainfall is fairly heavy and generally well distributed throughout the year at this site. Heavier rains occur in the spring and early summer. Snow falls nearly every winter, but complete cover is limited to only a few days per snowfall event. Total normal annual precipitation from all sources is about 36 inches (USDC 1983). The prevailing wind is from the south (USDA 1982).

The population within a 4-mile radius of the site is estimated at approximately 207,100 persons, with approximately 3755 persons within a 1-mile radius on the Missouri side of the river (E&E/FIT 1991).

The site is essentially flat, with a gentle slope to the east. A 500-year, concrete flood wall was constructed by the Corps of Engineers and separates the site from the Mississippi River. The runoff from the site is collected in the storm sewer. The storm sewer is connected to the sanitary sewer system, with the wastewater flowing to the Bissle Point Treatment Plant located approximately 2.5 miles upstream (E&E/FIT 1991).

The site occupies part of the land which was the location of the Laclede Gas and Light Company former manufactured gas plant (FMGP) in the late 1800s to the mid-1940s (Figure 3). Laclede Gas used a retort process for coal carbonization in the generation of gas. Approximately 930 million gallons of coal tar waste were produced at this facility. It is estimated that approximately 76 percent of the waste was sold, with the remaining 24 percent being buried on-site (E&E/FIT 1988). This equates to approximately 224 million gallons of coal tar waste potentially buried at the site. On-site burial was typically conducted in unlined pits. In 1940, operations were split between Laclede Gas Light Company (Laclede Gas) and Laclede Power and Light Company (Laclede Electric) (E&E/FIT 1991 & 1988).

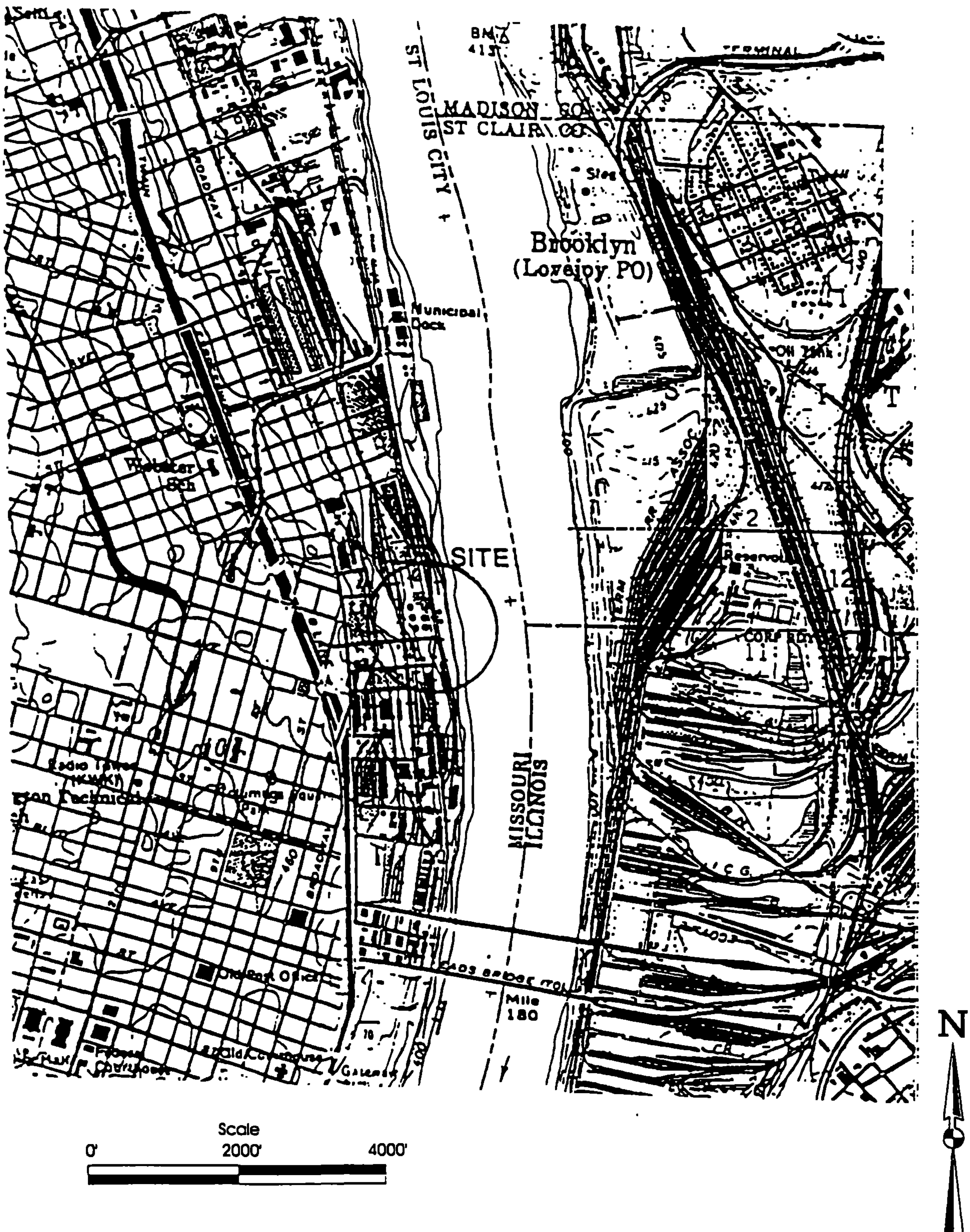
In 1945, Union Electric purchased the entire coal gas facility and operated the Mound Street Power Plant from 1945 to 1973. Union Electric did not manufacture coal gas at this site. In 1969, the Apex Oil Company purchased the former coal gas works (Laclede Gas works) from Union Electric; however, UE continued to operate the electrical facility from the former Laclede Electric facility (Figure 4). The Apex Company utilized the site as a tank farm for the storage of petroleum fuels until the mid-1980s, when it became an asphalt product terminal (Figure 4) (E&E/FIT 1991 & 1988).

In 1973, the Union Electric property was transferred to the Tenlis Company. Tenlis dismantled the power generation and transmission equipment. Transformer oil was reportedly disposed by Midwest Oil Company. The dismantled equipment was sold as scrap metal (E&E/FIT 1988).

In 1981, Tenlis transferred the property to AZCON (E&E/FIT 1991). The operations of AZCON are unknown, however, it was reported in the PA report that AZCON could have been a metal recycling company (MDNR 1994a).

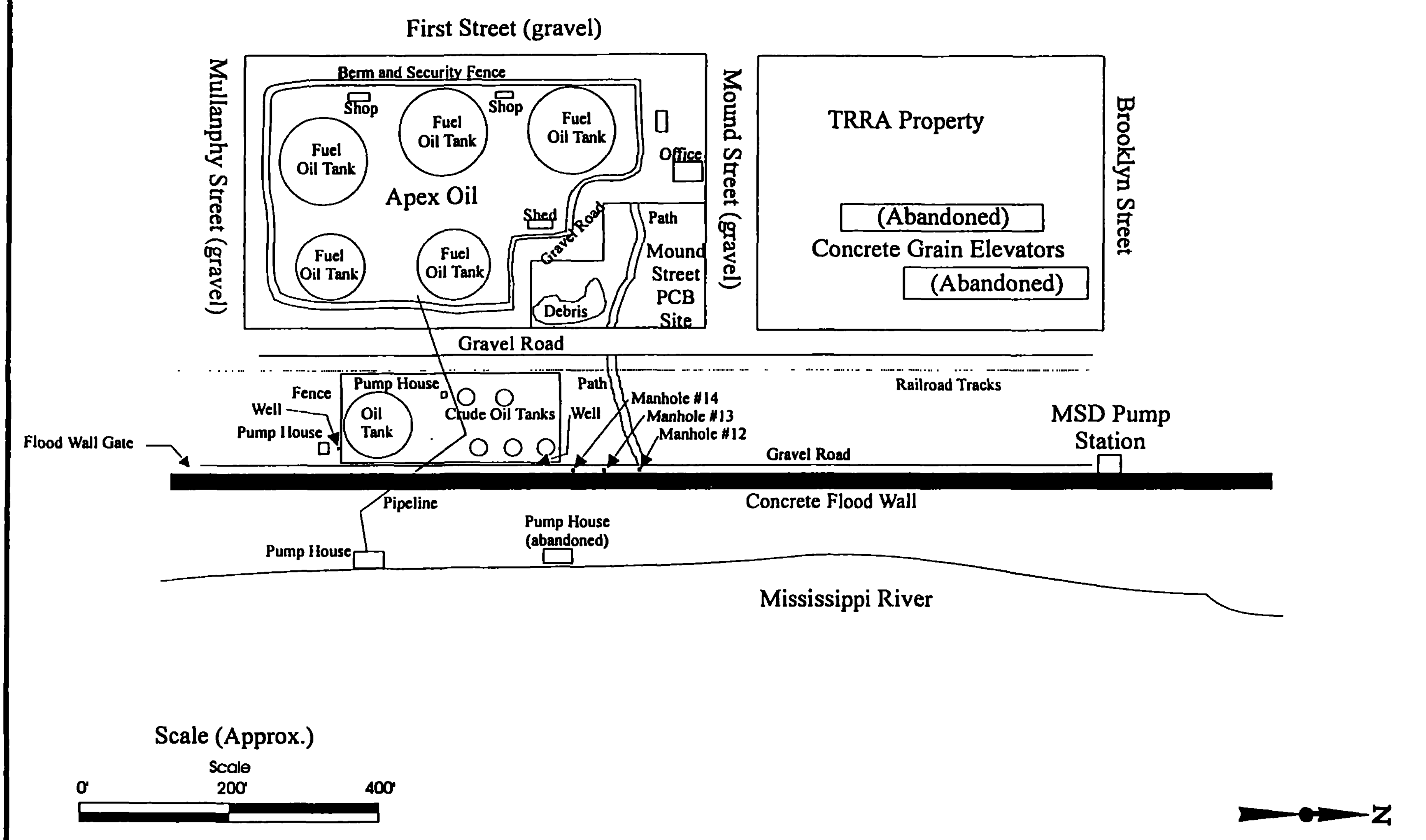
In 1985, Mound Street Corporation became the property owner and leased the building to an individual for an electric motor stripping operation (E&E/FIT 1991). An oil fire occurred in the basement of the building in 1989, and the building was demolished in the spring of 1991 (MDNR 1994a).

McKinley Iron became the owner of the property in 1993 (MDNR 1994a). The property does not have any buildings or other structures and is currently vacant (Falls 1993a, Sverdrup 1995a & b).

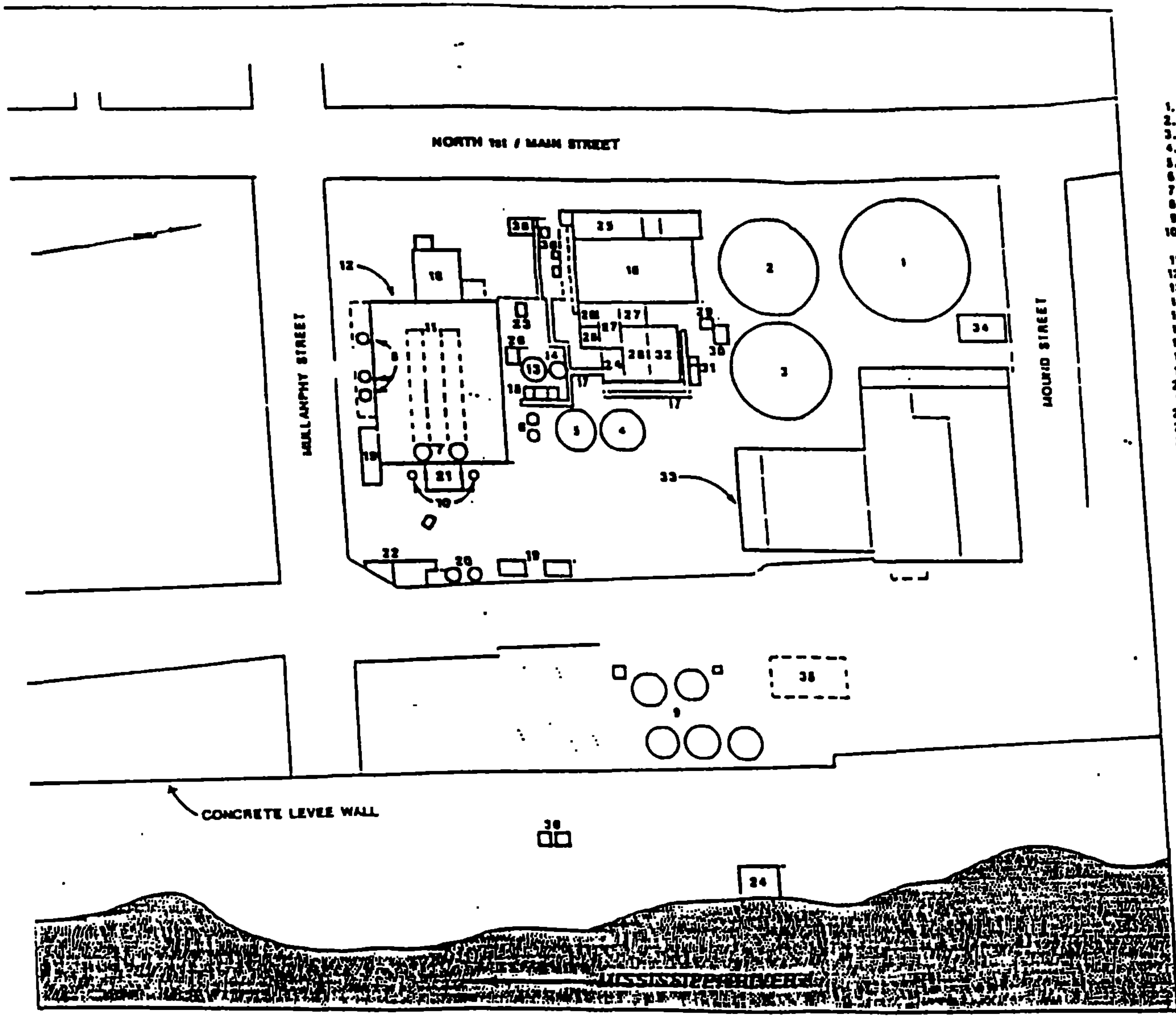


Source: U.S. Geological Survey (USGS). 1954. Granite City, Illinois (photorevised 1974). 7.5 Minute Series Topographic Map.

Project No.: 010865-370303	Mound Street PCB Site St. Louis, Missouri	Site Location Map	Figure No.: 1
	SVERDRUP		11/95



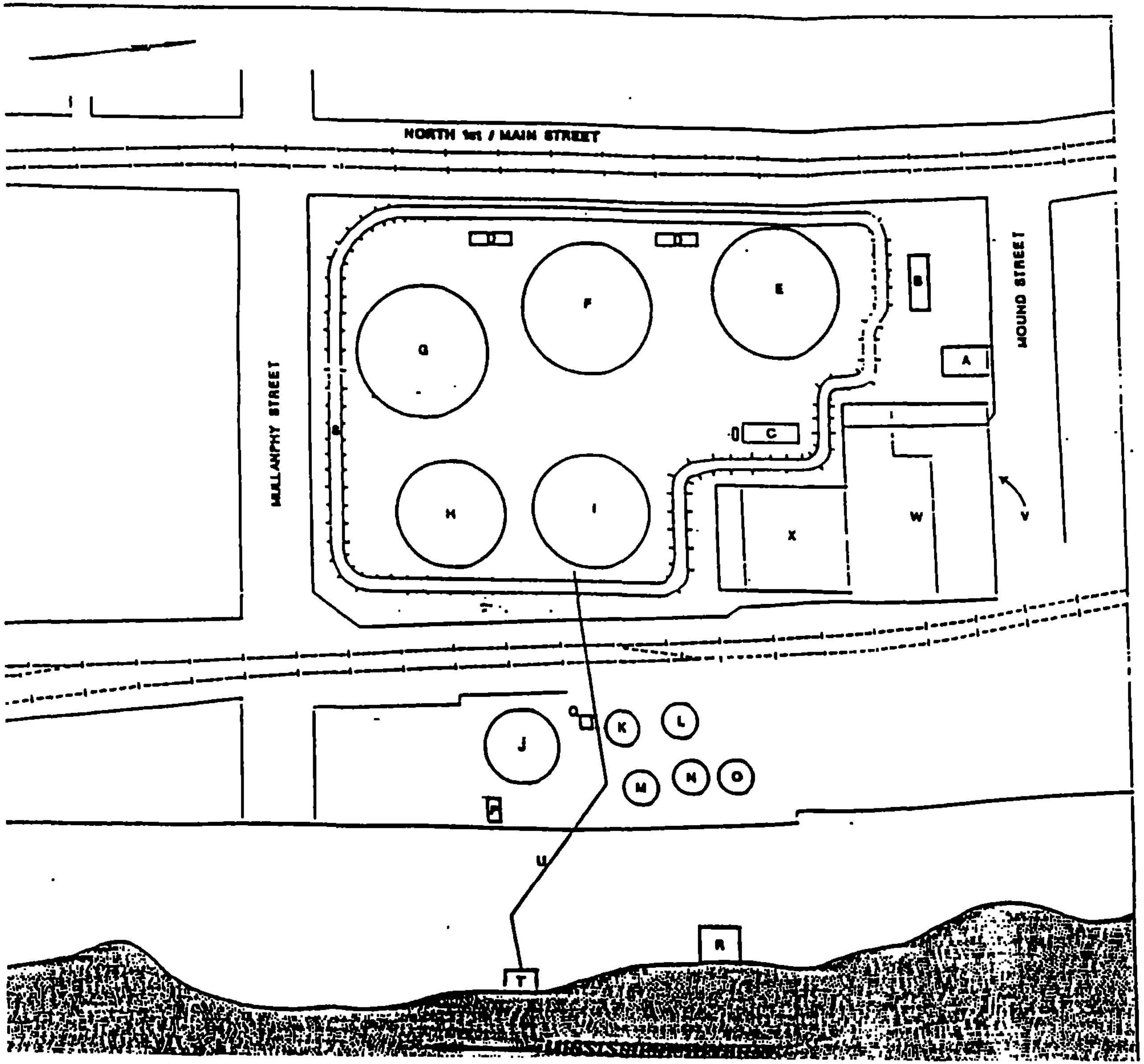
Sources: E&E/FIT 1991. SSI Laclede Coal Gas Site, St. Louis, Missouri. MDNR 1994. PA Mound Street PCB Site. GEHM 1993. Activities Report, TRRA of St. Louis, First and Mound Streets Site, MDNR Spill Report #07143-KB-1331.	Project No.: 010865-370303	Mound Street PCB Site St. Louis, Missouri SVERDRUP	Site Map	Figure No.: 2 11/95



EXPLANATION

1. GAS HOLDER (757.927 Cubic Feet)
2. GAS HOLDER (656.431 Cubic Feet)
3. GAS HOLDER (337.368 Cubic Feet)
4. GAS PURIFIER (686 Cubic Yards)
5. GAS PURIFIER (686 Cubic Yards)
6. 3 – GAS SCRUBBERS (2.714 Cubic Feet Each)
7. 2 – TANKS, USE UNKNOWN (2.728 Cubic Feet Each)
8. 3 – TANKS, USE UNKNOWN (2.714 Cubic Feet Each)
9. 5 – FUEL OIL TANKS (130.725 Gallons Each)
10. 2 – RETORT SMOKE STACKS (80 Feet High And 5 Feet In Diameter Each)
11. 2 – BANKS OF RETORTS
12. RETORT HOUSE
13. AMMONIA WELL (55.111 Gallons)
14. AMMONIA WELL (22.828 Gallons)
15. TAR SEPARATOR (1.2244 Gallons)
16. PURIFIER HOUSE
17. PIPE TRENCHES (3 Feet Deep By 4 Feet Wide)
18. BLOWER HOUSE
19. GARAGE
20. TAR TANKS (53.844 Gallons Each)
21. STORAGE SHED
22. BLACKSMITH AND CARPENTER SHOP
23. STORAGE HOUSE
24. PUMP HOUSE
25. OFFICE AND METER ROOM
26. LABORATORY AND MACHINE SHOP
27. SCRUBBER HOUSE
28. CONDENSER HOUSE
29. GOVERNOR HOUSE
30. VALVE HOUSE
31. METER AND SWITCH HOUSE
32. EXHAUSTERS AND BLOWERS
33. LACLEDE ELECTRIC POWER FACILITY
34. OFFICE
35. TRANSFORMERS
36. UNKNOWN

Source	Project No.	Project	Title	Figure No.
Source: E&E/FIT 1991. SSI Laclede Coal Gas Site, St. Louis, Missouri	Project No.: 010865-370303	Mound Street PCB Site St. Louis, Missouri SVERDRUP	Laclede Gas Coal Site circa 1900	Figure No.: 3 11/95



EXPLANATION

APEX OIL COMPANY
ST. LOUIS TERMINAL STRUCTURES

A. OFFICE
B. TANKER TRUCK LOADING PLATFORM
C. EQUIPMENT SHED
D. EQUIPMENT/WORK SHOP
E. FUEL OIL TANK (80.000 Barrels)
F. FUEL OIL TANK (80.000 Barrels)
G. FUEL OIL TANK (80.000 Barrels)
H. FUEL OIL TANK (80.000 Barrels)
I. FUEL OIL TANK (55.000 Barrels)
J. OIL TANK
K. CRUDE OIL TANK
L. CRUDE OIL TANK
M. CRUDE OIL TANK
N. CRUDE OIL TANK
O. CRUDE OIL TANK
P. PUMP HOUSE
Q. PUMP HOUSE
R. PUMP HOUSE (Abandoned)
S. CONTAINMENT BERM
(For Fuel Oil Tanks, Capped With A Chain-link Fence)
T. PUMP HOUSE
U. RIVER TANKER OFF-LOADING PIPES

FORMER UNION ELECTRIC
MOUND ST. FACILITY

V. FORMER UNION ELECTRIC BUILDING
W. GENERATOR ROOM (Basement Plan)
X. BOILER ROOM (Basement Plan)

SCALE
0 200
FEET

Source: E&E/FIT 1991. SSI Laclede Coal Gas Site, St. Louis, Missouri	Project No.: 010865-370303	Mound Street PCB Site St. Louis, Missouri SVERDRUP	Apex Oil Terminal and Union Electric Sites circa 1990	Figure No.: 4 11/95

2.3 PREVIOUS INVESTIGATIONS AND WASTE CHARACTERISTICS

The Mound Street PCB Site has had numerous investigations conducted since 1976.

- The Missouri Department of Natural Resources (MDNR) submitted a Preliminary Assessment (PA) report on the Mound Street PCB Site on March 21, 1994. Field activities for the PA occurred on November 11, 1993. No samples were collected during the PA. The conclusions of the PA report indicate that a threat from the groundwater pathway is very unlikely, a release to the Mississippi River appears likely, an exposure through the soil pathway is low and an exposure through the air pathway is also low.

- On July 8, 1993 St. Louis Metropolitan Sewer District (MSD) personnel discovered oil seeping into the Brooklyn Street storm water pump station, located at the end of Brooklyn Street and approximately 400 feet north of the Mound Street PCB Site (Falls 1993a). A waste oil sample from the pump station wet well was collected and analyzed for PCBs by the MSD. A PCB concentration of 47 mg/L was detected (MSD 1993a). On August 9, 1993, a waste oil sample from three manholes were collected and analyzed for PCBs by the MSD. The concentrations of PCBs were 25.4 mg/L in Manhole F-GA1 (#12), 11.7 mg/L in Manhole F-GA1 (#13), 36.6 mg/L in Manhole F-GA1 (#14) (MSD 1993b). Five 55-gallon drums of waste oil were pumped out of the storm sewer by REACT Environmental Engineers and disposed by Tipton Environmental Services (Falls 1993a, Edmond 1993).

  A 12,000-gallon underground storage tank (UST) containing petroleum products was discovered during an investigation to identify the potential source of the PCBs in the pump station (GEHM 1993a). The UST was located on Terminal Railroad Association (TRRA) property, southwest of the Brooklyn Street pump station (Figure 5). The TRRA property is located on the north side of Mound Street, directly across from the Mound Street PCB Site. A sample was collected from the UST on July 14, 1993 by MSD. Sample analysis showed PCBs in the UST at 39 mg/L (MSD 1993a). The existence of the UST was unknown to TRRA prior to notification by the St. Louis Fire Marshall. The tank contents were removed by Environmental Operations, under supervision by GEHM Corporation, on August 4, 1993. Sample analysis of the tank contents showed PCBs at less that 10 mg/kg. Sixteen 55-gallon drums of waste were removed from the UST. On August 17, 1993 EnTech Engineering, under supervision by GEHM Corporation, conducted an Infrared Thermograph survey of the TRRA Site. No evidence of a leak plume was identified during this study. An anomaly was discovered, approximately 10 foot square, on the Mound Street PCB property. Boreholes were attempted at the location of the anomaly; however, they were abandoned after auger refusal at a depth of 5 feet due to encountering solid rock debris (GEHM 1993a). The foundation or basement of the demolished Mound Street Site buildings could explain the presence of the IR/T anomaly (Falls 1993a).

- The Ecology and Environment/Field Investigation Team (E&E/FIT) submitted a Screening Site Investigation (SSI) report on the Laclede Gas and Light FMGP Site on October 29, 1991. Field activities for the SSI occurred on March 3-9, 1991. Subsurface soil, surface soil, sediment, surface water and groundwater samples were collected at and around the Petroleum Fuels and Terminal Company property. No samples were collected from the basement of the Mound Street Power Plant Building (Mound Street PCB Site), as originally planned, since the building was being demolished at the time of the SSI field activities. Five borehole screening locations, four surface soil sample locations, three groundwater sample locations, three surface water sample locations, and three sediment sample locations are in the vicinity of the Mound Street PCB Site (Figure 6a and 6b). Analytical results for the soil screening samples, sediment samples and surface soil samples are shown in Table 2-1. Five groundwater samples were collected. Groundwater sample analysis shows 65 ug/L acenapthalene, 25 ug/L fluorene, 46 ug/L phenanthene, 93 ug/L benzene and 1600 ug/L cyanide in Well 204. Well 203 sample analysis did not show any contamination except for 590 ug/L cyanide. Both cyanide results are "J" coded, the value is reported but not valid under approved QC procedures. Well 206 did not show any contamination. Arsenic, barium, copper, chromium, nickel, selenium, vanadium, and zinc were not detected in four surface water samples except as indicted in the following discussion. Surface water sample analysis show lead levels ranging from 7.0 ug/L to 24 ug/L. Sample location 303 also showed barium at 280 ug/L, vanadium at 62 ug/L, zinc at 89 ug/L and an invalid selenium result of 11 ug/L. Sample location 304 and 304D showed chromium at 14 ug/L and 12 ug/L, respectively. Sample location 304 also had a result of 54 ug/L for zinc.None of the samples collected during the SSI were analyzed for PCBs.

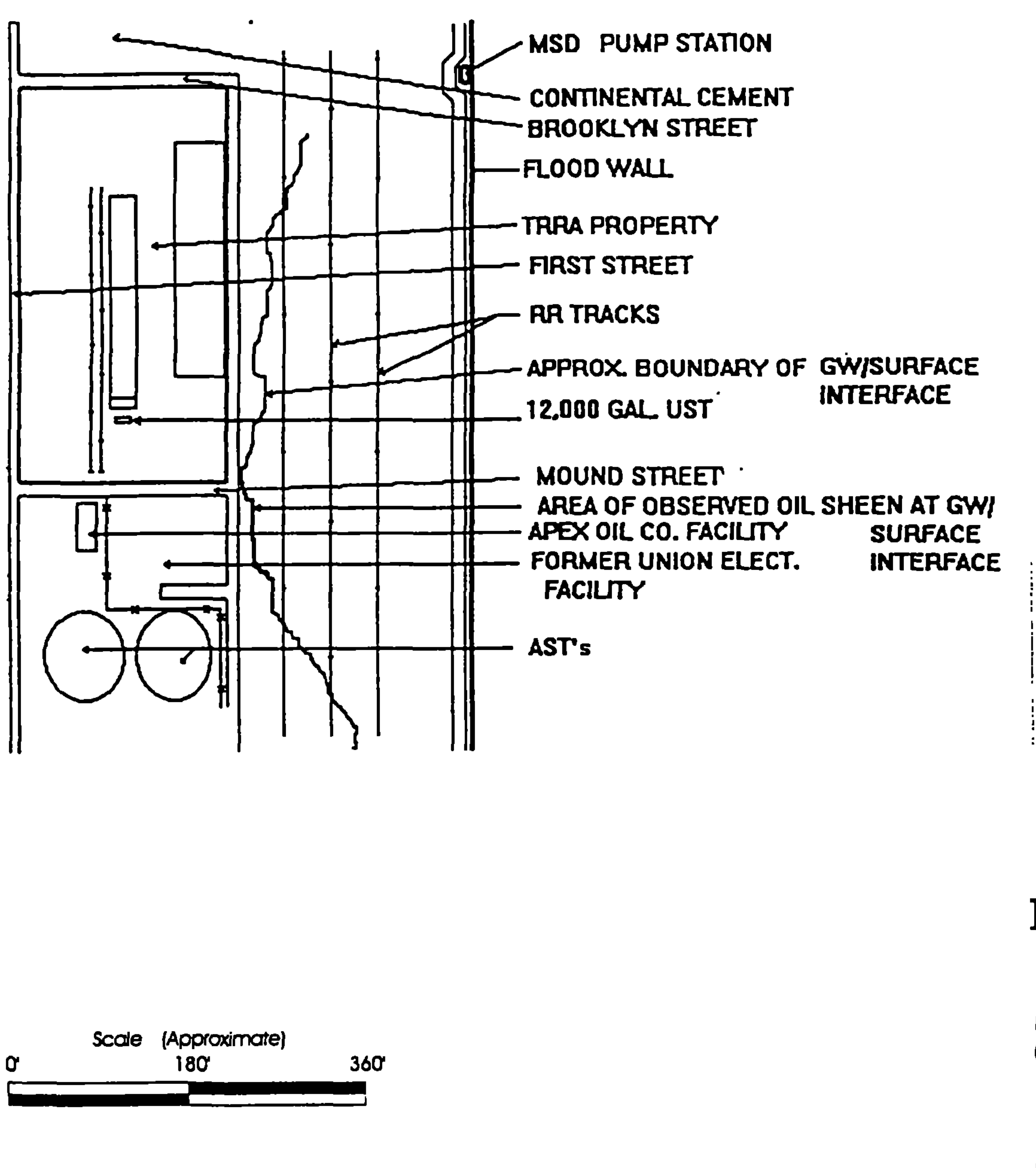
- The E&E/FIT conducted a site reconnaissance of the Laclede Gas and Light FMGP on November 20, 1990 for the preparation of the SSI work plan. Seepage was observed emanating from the foundation and piping system of an abandoned pump house, formerly owned by the Mound Street Power Plant. The pipes were reportedly plugged with concrete, however, seepage was leaching through the concrete.

The pump house is located on the eastern side of the flood wall, therefore, the seepage was going directly into the Mississippi River. No samples were collected during the site reconnaissance (E&E/FIT 1991).

- The E&E/FIT submitted a Preliminary Assessment (PA) report of the Laclede Gas and Light FMGP on June 23, 1988. The field activities were conducted on September 17, 1987. Six oil, water and oil/water mixture samples were collected from the Mound Street building basement and two from adjacent manholes during the PA site reconnaissance (Figure 7). The samples were analyzed for PCBs. No PCB contamination was detected at a 1 mg/kg detection limit in any of the samples. The source of oil in the basement of the Mound Street Power Plant building (Mound Street PCB Site) was potentially identified as the adjacent Apex Oil terminal. It was stated in the report that Apex Oil has had numerous spills, some of which entered the Mound Street building basement. Transformers and hydraulic oil tanks, located in the Mound Street building basement, were supposedly drained and removed in the 1970s; however, no records confirming this were available.

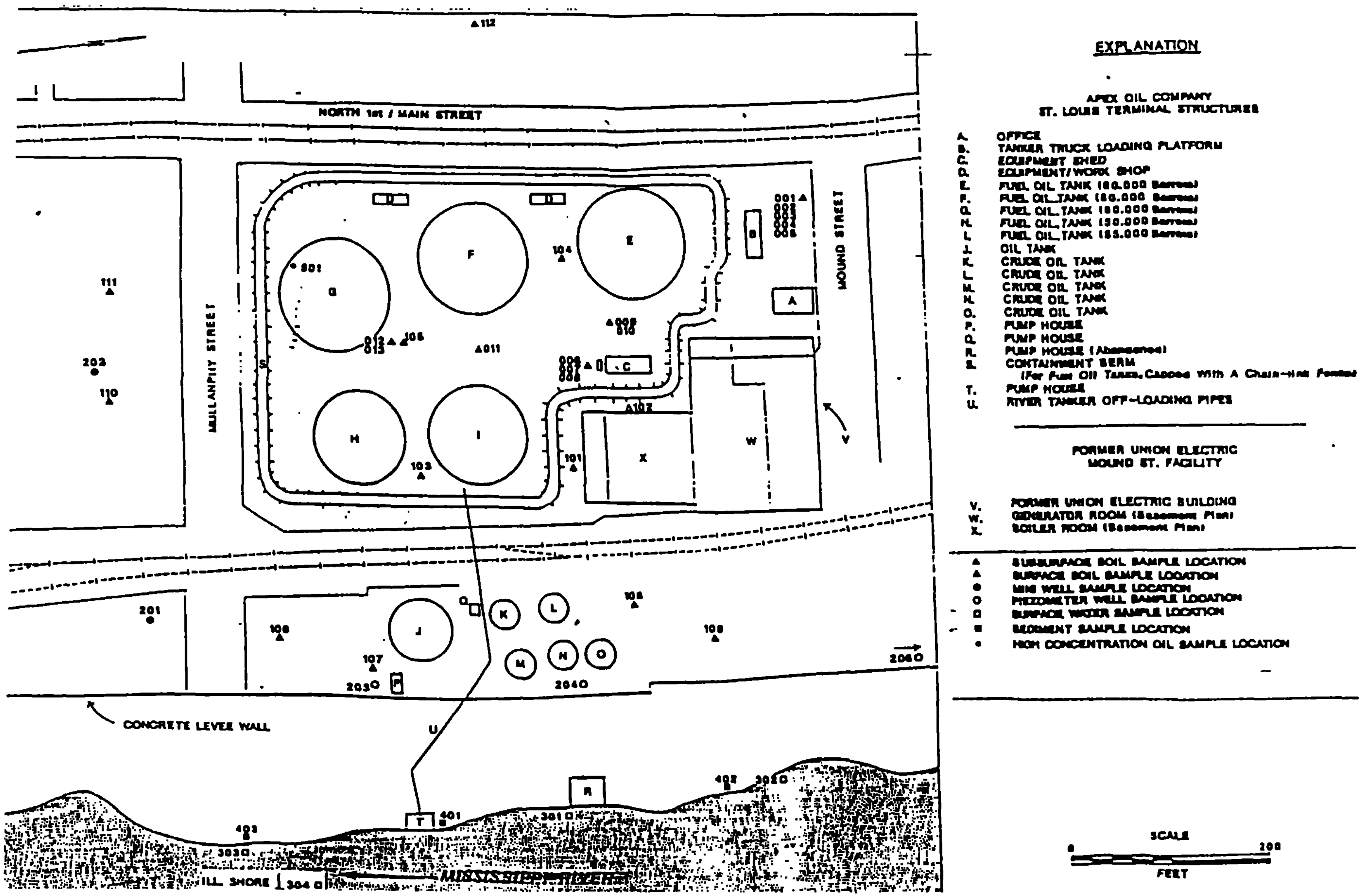
- The St. Louis City Division of Health conducted an investigation of the Mound Street Power Plant on April 8, 1987. Six oil samples were collected from the basement of the Mound Street building and analyzed for PCBs. No PCB contamination was identified; however, detection limits were not recorded (E&E/FIT 1991 & 1988).

- The U.S. Coast Guard has investigated oil slicks in the Mississippi River in the vicinity of the Mound Street PCB Site three times from 1976 to 1987. The oil slicks were reportedly originating from the Mound Street Power Plant. The basement of the Mound Street Power Plant was the suspected source of oil. No samples were collected during any of the Coast Guard investigations (E&E/FIT 1991 & 1988).

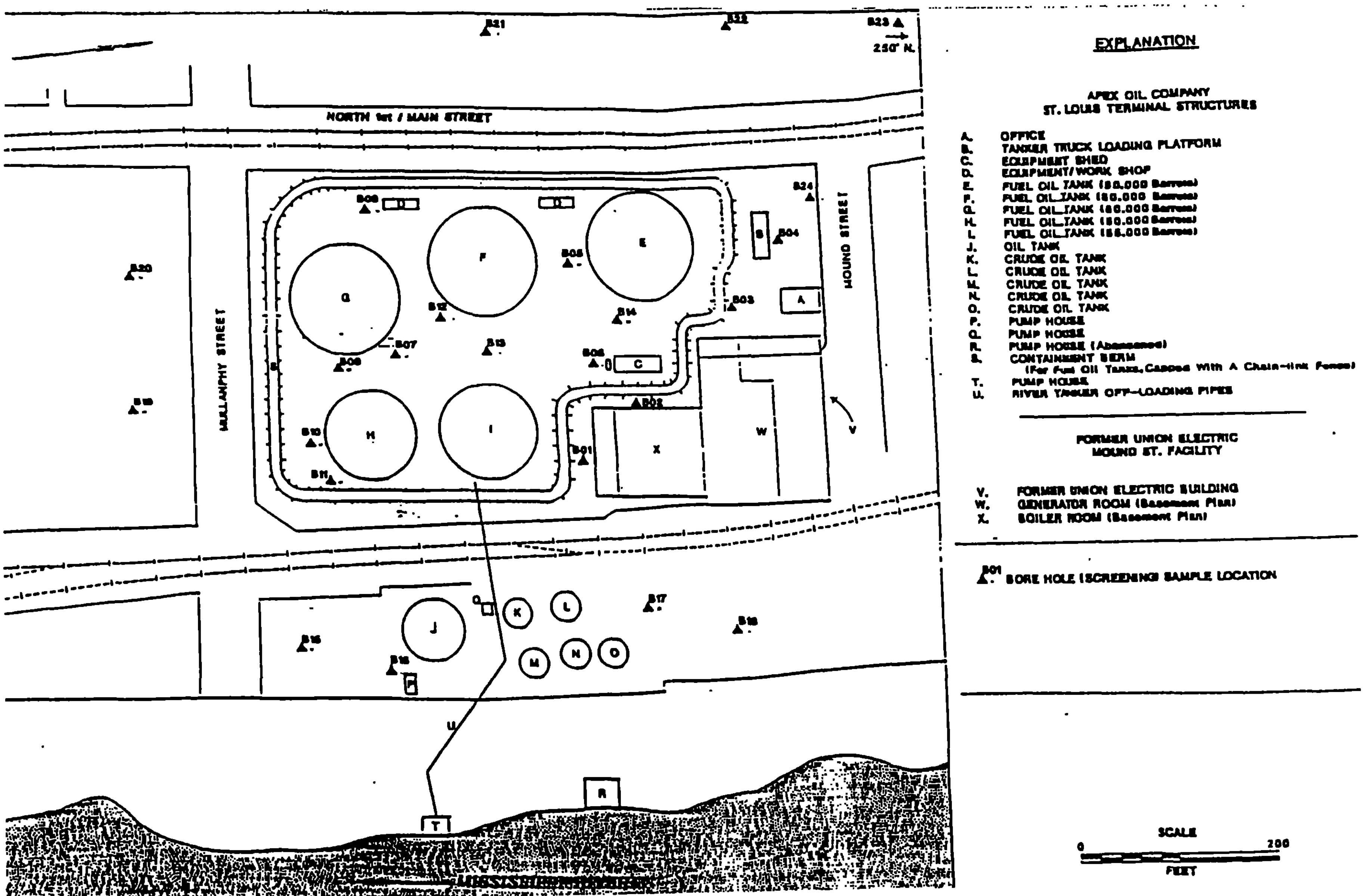


Source: GEHM 1993. Activities Report, TRRA of St. Louis, First and Mound Streets Site, MDNR Spill Report #07143-KB-1331

Project No.: 010865-370303	Mound Street PCB Site St. Louis, Missouri SVERDRUP	TRRA UST Location Map	Figure No.: 5 11/95



Source: E&E/FIT 1991. SSI Laclede Coal Gas Site, St. Louis, Missouri	Project No.: 010865-370303	Mound Street PCB Site St. Louis, Missouri SVERDRUP	Laclede Coal Gas SSI Sample Location Map	Figure No.: 6a 11/95



Source: E&E/FIT 1991. SSI Laclede Coal Gas Site, St. Louis, Missouri

Project No.: 010865-370303

Mound Street PCB Site
St. Louis, Missouri

SVERDRUP

Laclede Coal Gas SSI
Sample Location Map

Figure No.: 6b

11/95

Table 2-1. Screening Site Inspection, Sample Analysis Results,Laclede Coal Gas Site								
Field Analytical Support Program Mobile Laboratory Screening Results								
Sample No.	Benzene (ug/kg)	Toluene (ug/kg)	Xylene (ug/kg)	Fluor anthene (ug/kg)	Pyrene (ug/kg)	Benzo(k) fluor anthene (ug/kg)	Benzo(a) pyrene (ug/kg)	Comments
B01 (borehole soil sample)	1200	380	1700	16000	3700	NT[A]	NT	0-5 ft sample depth, same location as surface soil sample 101
B02 (borehole soil sample)	6300	43000	240000	8000	<500	<500	<500	0-5 ft sample depth, same location as surface soil sample 102
B03 (borehole soil sample)	1040	22000	22000	<500	<500	<500	<500	0-5 ft sample depth
B17 (borehole soil sample)	540	<250	21000	<500	<500	<500	<500	0-5 ft sample depth, same location as surface soil sample 108
B18 (borehole soil sample)	<250	<250	<250	<500	<500	<500	<500	0-5 ft sample depth, same location as surface soil sample 109
B23 (borehole soil sample)	<250	<250	<250	<500	<500	<500	<500	0-5 ft sample depth, background soil sample
401 (sediment sample)	<250	<250	<250	NT	NT	NT	NT	Sediment sample
402 (sediment sample)	<250	<250	1600	<500	<500	<500	<500	Sediment sample
403 (sediment sample)	<250	<250	420	2600	5400	4200	3800	Sediment sample
301 (surface water sample)	<25	<25	<25	NT	NT	NT	NT	Surface water sample
302 (surface water sample)	<25	<25	<25	NT	NT	NT	NT	Surface water sample
303 (surface water sample)	<25	<25	<25	NT	NT	NT	NT	Surface water sample

Surface Soil Samples

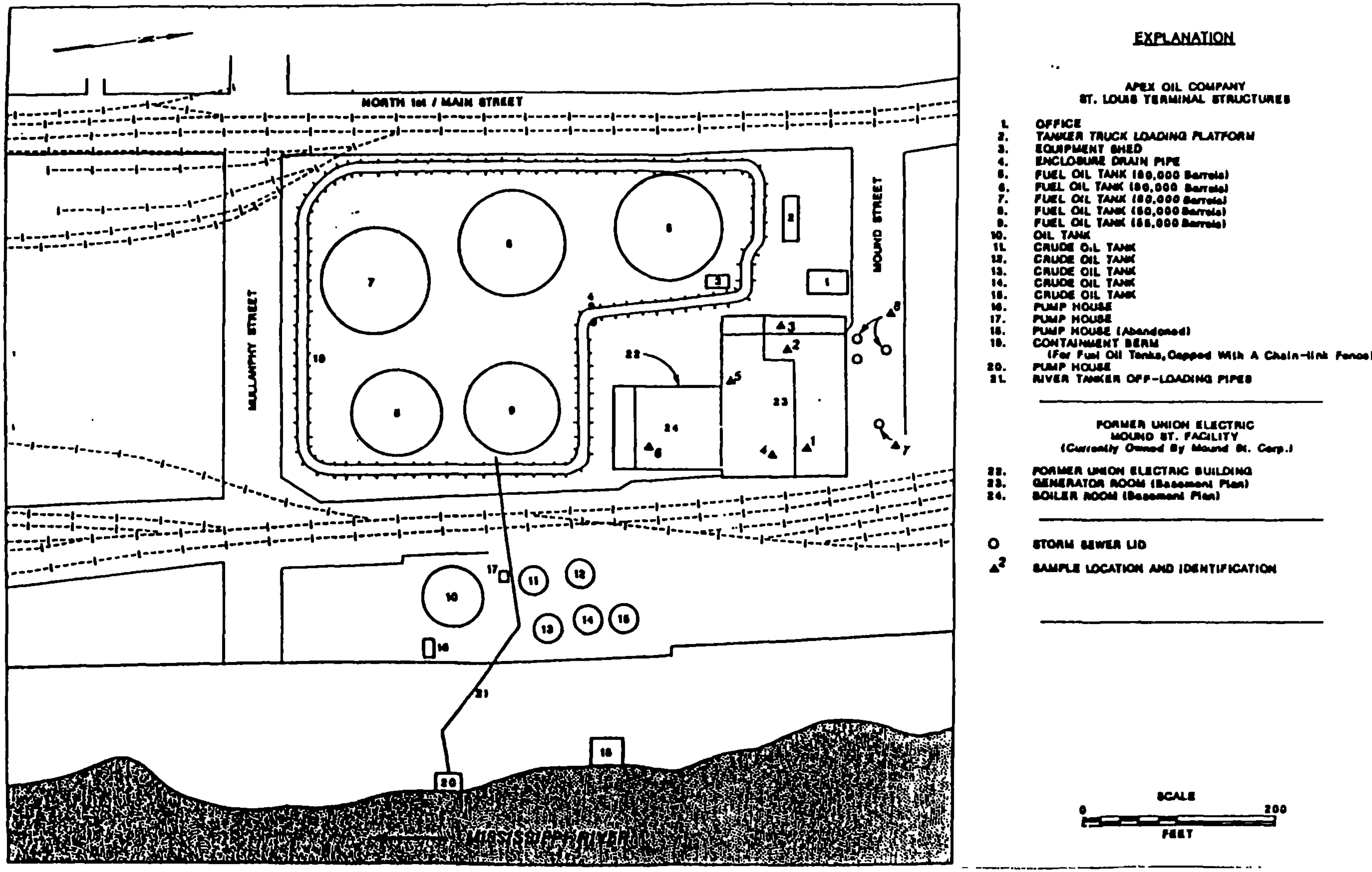
Sample No.	Pyrene (mg/kg)	Benzo(k) fluor anthene (mg/kg)	Benzo(a) pyrene (mg/kg)	Benzo(b) fluor anthene (mg/kg)	Benzo(a) anthracene (mg/kg)	Chrysene (mg/kg)	Total PAHs (mg/kg)	Cyanide (mg/kg)	Comments
101 (B01)	ND[B]	ND	ND	ND	ND	ND	ND	33	0-2 ft sample depth
102 (B02)	21	ND	ND	ND	ND	ND	21	ND	0-2 ft sample depth
107 (B16)	ND	ND	ND	ND	ND	ND	73[E]	14	0-2 ft sample depth
108 (B17)	ND	ND	ND	ND	ND	ND	9.8	98	0-2 ft sample depth
109 (B18)	6.7	3.4	4.2	4.9	4.5	4.3	40	35	0-2 ft sample depth
112 (B21, background sample)	1.4	0.68	0.7	0.61	0.79	0.85	6.8	<6.7	0-2 ft sample depth, background soil sample

Sediment Samples

Sample No.	Pyrene (u/kg)	Benzo(k) fluor anthene (u/kg)	Benzo(a) pyrene (u/kg)	Benzo(a) anthracene (ug/kg)	Cyanide (ug/kg)	Total Hydro carbons (ug/kg)	Total Arsenic (mg/kg)	Total Barium (mg/kg)	Total Chromium (mg/kg)	Total Lead (mg/kg)
401	ND/960[C]	ND/ND[C]	ND/430[C]	ND/460[C]	ND/ND[C]	3100/ <3100[C]	3.7/4.0[C]	140/140[C]	8.7/9.0[C]	30J/13J[D]
402	8000	2900	2600	3500	1600	8200	8.4	160	16	36J[D]
403	6400J[D]	3100	5600	4200	ND	4900	7.1	160	12	31J[D]

A NT = Not Tested.
B ND = Non detected.
C Sample results/duplicate results.
D J = Results reported but are invalid by approved QC procedures.
E 60 mg/kg naphthalene detected.

Source: E&E/FIT 1991.



Source: E&E/FIT 1988. PA Mound Street Power Plant Site, St. Louis, Missouri	Project No.: 010865-370303	Mound Street PCB Site St. Louis, Missouri SVERDRUP	Mound Street Power Plant PA Sample Location Map	Figure No.: 7 11/95

Waste Characteristics

The contaminants of concern at the Mound Street PCB Site originate from two separate sources; coal gas operations and electrical power generation and transmission operations. The former is a source for coal tar wastes and spent oxides, while the latter is a source for PCBs. Coal tar wastes include polynuclear aromatic hydrocarbons (PAHs) and phenolic compounds resulting from combustion processes, and spent iron oxides resulting from gas purification processes. Benzene, toluene and xylene are possible constituents of coal tar wastes. Iron oxides may contain sulphur, cyanide and small quantities of coal tar. PCBs are found in transformer and hydraulic oil. It is estimated that approximately 223,680,000 gallons of coal tar may be buried on the former Laclede Coal Gas Site, which includes the Mound Street PCB Site (E&E/FIT 1991). The quantity, if any, of PCB contaminated oil in the subsurface is not known.

3.0 COLLECTION OF NONSAMPLING DATA

Nonsampling data collection will include verification of site historical data and obtaining additional information, as required, to assess potential sources at the site. Additionally, information will be collected to determine potential environmental and human targets possibly affected by site contamination. Data collected will assess all targets within a 4-mile radius of the site and 15-mile downstream distance limit along a primary surface water drainage pathway.

4.0 SAMPLING ACTIVITIES

The objectives of the Screening Site Inspection (SSI) are to collect analytical data to identify hazardous substances at the site and assess the overall threat to human health and the environment. To accomplish this task, appropriate methodologies will be utilized for sample collection. Data Quality Objectives (DQOs) are outlined in Table 4-1. Required method detection limits have been identified to obtain the quality data required to assess contaminant levels within groundwater and soil.

In addition, assessment of source area contamination will be completed. Oil samples, collected on two separate occasions from the basement of the Mound Street PCB Site building, showed no detectable PCB contamination. Groundwater, surface water, soil and sediment samples have been collected near the site during previous investigations of the adjacent Apex Oil facility. Soil and sediment results are summarized in Table 2-1. Groundwater and surface water results are discussed in Section 2.3.

In order to demonstrate a release, sample locations must be chosen to demonstrate that the hazardous substance is present at levels significantly above the known background concentrations. Background is the ambient concentration of a hazardous substance and includes naturally occurring concentrations, concentrations from man-made sources other than the site being evaluated, and concentrations from the site. Generally, background levels are best supported by chemical analysis. No background samples will be collected during this SSI field activity. Background soil levels for volatile and semi-volatile organic compounds were identified in a 1991 SSI of the adjacent Apex Oil facility, conducted by E&E/FIT. A nondetect background level for PCBs will be assumed since they are man-made.

DQOs have been determined for soil in order to achieve the lowest possible detection limits for the purpose of identifying background levels, and contaminant levels in the site area. To achieve these levels, appropriate analytical methods will be utilized for soil samples.

Proposed sample locations are depicted in Figure 8. Samples to be collected are summarized in Table 4-2. QA/QC samples to be collected are also included. The EPA Region VII Activity Number assigned to this sampling event is DC1CY.

TABLE 4-1

Data Quality Objectives (DQOs)

Polychlorinated Biphenyl Analysis by SW-846 Methods

Analyte	*Matrix*	*Method*	*Requested Detection Limits (ug/L)*
Aroclor - 1016	Water	8080	1
Aroclor - 1221	Water	8080	1
Aroclor - 1232	Water	8080	2
Aroclor - 1242	Water	8080	1
Aroclor - 1248	Water	8080	1
Aroclor - 1254	Water	8080	1
Aroclor - 1260	Water	8080	1
Analyte	*Matrix*	*Method*	*Requested Detection Limits (ug/kg)*
Aroclor - 1016	Soil	8080	33
Aroclor - 1221	Soil	8080	33
Aroclor - 1232	Soil	8080	67
Aroclor - 1242	Soil	8080	33
Aroclor - 1248	Soil	8080	33
Aroclor - 1254	Soil	8080	33
Aroclor - 1260	Soil	8080	33

Method 8080 - Gas Chromatograph

TABLE 4-1

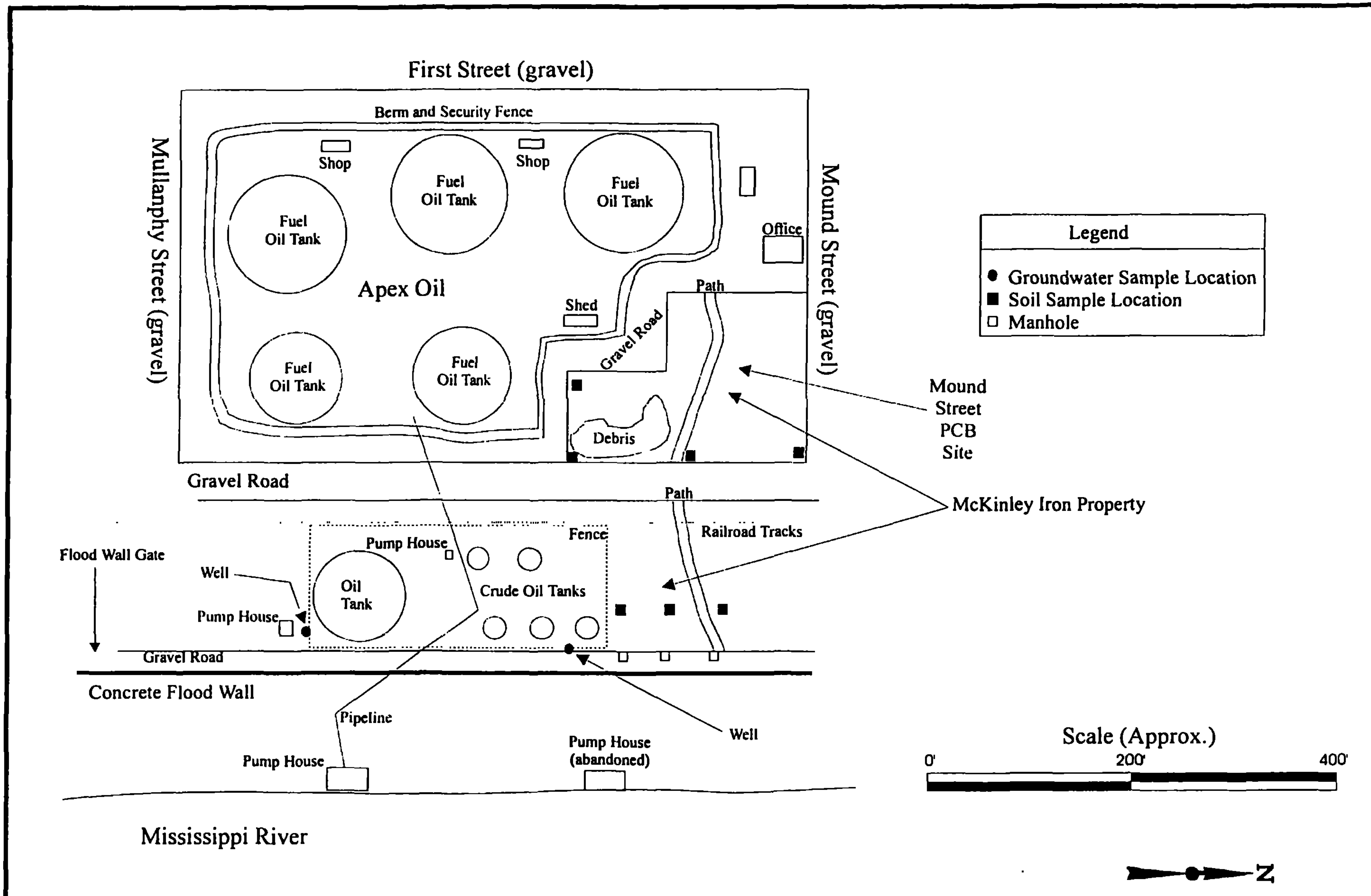
Data Quality Objectives (DQOs)

Volatile Organic Analysis by SW-846

Analyte	*Matrix*	*Method*	*Requested Detection Limits (ug/L)*
Volatiles	Water	8240	10
Semi Volatiles	Water	8270	10
Analyte	*Matrix*	*Method*	*Requested Detection Limits (ug/kg)*
Volatiles	Soil	8240	250
Semi Volatiles	Soil	8270	500

Method 8240 - Gas Chromatograph/Mass Spectrometry

Method 8270 - Gas Chromatograph/Mass Spectrometry



Sources: E&E/FIT 1991. SSI Laclede Coal Gas Site, St. Louis, Missouri. MDNR 1994. PA Mound Street PCB Site.	Project No.: 010865-370303	Mound Street PCB Site St. Louis, Missouri SVERDRUP	Proposed Sample Location Map	Figure No.: 8 1/96

4.1 GROUNDWATER SAMPLING

Groundwater samples will be collected from two existing wells; monitoring wells located on the Apex Oil facility southeast of the site and on the west side of the flood wall. Water samples will be analyzed for volatile organic compounds by SW-846 Method 8240, semi-volatile organic compounds by SW-846 Method 8270, and PCBs by SW-846 Method 8080. Groundwater samples collected from existing wells will be used to determine the presence of contaminants in the groundwater. The wells will be purged prior to sample collection. The pH, conductivity, and temperature of the groundwater will be verified for stability prior to sampling.

Purging and water sampling activities will be performed using disposable bailers on the two existing wells. In addition, one water sample will be collected from an on-site geoprobe boring, utilizing the geoprobe. A new bailer will be used for each well location. No decontamination of the bailers is proposed. All groundwater sampling activities will be in accordance with Region VII SOP 2334.15A, Groundwater Sample Collection. Since no true background well will be sampled, the groundwater samples will be compared to current MCLs and MCLGs.

4.2 SOIL SAMPLING

Subsurface soil samples will be collected at seven locations. Four samples will be collected on the Mound Street PCB Site to determine the contaminant concentrations in the subsurface soils at this location. Three samples will be collected between the site and flood wall, parallel to the Mississippi River. Soil samples will be analyzed for volatile organic compounds by SW-846 Method 8240, semi-volatile organic compounds by SW-846 Method 8270, and for PCBs by SW-846 Method 8080. Sample depth for all soil samples will be at geoprobe refusal, groundwater, or a maximum of 25 feet. Subsurface soil samples will be obtained utilizing a geoprobe in accordance with Sverdrup/CDM Federal Team SOP 1-4.

TABLE 4-2
Proposed Sample Activities
Mound Street PCB Site
St. Louis, Missouri

Sample No.	*Sample Description*	*Sample Location/Rationale*	*Analyses*	*Sample Containers*	*Preservatives*	*Holding Time*
MATRIX: Water						
DC1CY-001	Off-Site Monitoring Well	Off-site monitoring well/Identify contamination in aquifer.	PCBs	80 oz A.G. Bot	Ice to 4° C	7/40 d.
			VOL	2-40 ml vials	HCl, pH<2, Ice to 4° C	14 d.
			Semi-vol	80 oz A.G. Bot	Ice to 4° C	7/40 d.
DC1CY-002	Off-Site Monitoring Well	Off-site monitoring well/Identify contamination in aquifer.	PCBs	80 oz A.G. Bot	Ice to 4° C	7/40 d.
			VOL	2-40 ml vials	HCl, pH<2, Ice to 4° C	14 d.
			Semi-vol	80 oz A.G. Bot	Ice to 4° C	7/40 d.
DC1CY-003	On-Site Geoprobe boring	On-site Geoprobe boring/Identify contamination in aquifer.	PCBs	80 oz A.G. Bot	Ice to 4° C	7/40 d.
			VOL	2-40 ml vials	HCl, pH<2, Ice to 4° C	14 d.
			Semi-vol	80 oz A.G. Bot	Ice to 4° C	7/40 d.
DC1CY-003D	Duplicate of DC1CY-003	Duplicate	PCBs	80 oz A.G. Bot	Ice to 4° C	7/40 d.
			VOL	2-40 ml vials	HCl, pH<2, Ice to 4° C	14 d.
			Semi-vol	80 oz A.G. Bot	Ice to 4° C	7/40 d.
DC1CY-004F	Trip Blank	QA/QC	VOL	2-40 ml vials	HCl, pH<2, Ice to 4° C	14 d.
DC1CY-005F	Field Blank	QA/QC	PCBs	80 oz A.G. Bot	Ice to 4° C	7/40 d.
			VOL	2-40 ml vials	HCl, pH<2, Ice to 4° C	14 d.
			Semi-vol	80 oz A.G. Bot	Ice to 4° C	7/40 d.

PCBs - Polychlorinated Biphenyls.
VOL - Volatile organic compounds.
Semi-vol - Semi-volatile organic compounds.

7/40 d. - Extraction in 7 days, analysis in 40 days.
14 d. - Analysis in 14 days.
A.G. Bot. - Amber Glass Bottle.

TABLE 4-2

Proposed Sample Activities

Mound Street PCB Site

St. Louis, Missouri

Sample No.	*Sample Description*	*Sample Location/Rationale*	*Analyses*	*Sample Containers*	*Preservatives*	*Holding Time*
MATRIX: Soil						
DC1CY-006	On-site Geoprobe boring	Source area/Identify contamination of source area.	PCBs VOL Semi-vol	8 oz G. Jar 2-40 ml vials 8 oz G. Jar	Ice to 4° C Ice to 4° C Ice to 4° C	14/40 d. 14 d. 14/40 d.
DC1CY-007	On-site Geoprobe boring	Source area/Identify contamination of source area.	PCBs VOL Semi-vol	8 oz G. Jar 2-40 ml vials 8 oz G. Jar	Ice to 4° C Ice to 4° C Ice to 4° C	14/40 d. 14 d. 14/40 d.
DC1CY-008	On-site Geoprobe boring	Source area/Identify contamination of source area.	PCBs VOL Semi-vol	8 oz G. Jar 2-40 ml vials 8 oz G. Jar	Ice to 4° C Ice to 4° C Ice to 4° C	14/40 d. 14 d. 14/40 d.
DC1CY-008D	Duplicate of DC1CY-008	Duplicate	PCBs VOL Semi-vol	8 oz G. Jar 2-40 ml vials 8 oz G. Jar	Ice to 4° C Ice to 4° C Ice to 4° C	14/40 d. 14 d. 14/40 d.
DC1CY-009	On-site Geoprobe boring	Source area/Identify contamination of source area.	PCBs VOL Semi-vol	8 oz G. Jar 2-40 ml vials 8 oz G. Jar	Ice to 4° C Ice to 4° C Ice to 4° C	14/40 d. 14 d. 14/40 d.
DC1CY-010	Off-site Geoprobe boring	Off-site/Identify contaminant migration toward Mississippi River.	PCBs VOL Semi-vol	8 oz G. Jar 2-40 ml vials 8 oz G. Jar	Ice to 4° C Ice to 4° C Ice to 4° C	14/40 d. 14 d. 14/40 d.
DC1CY-011	Off-site Geoprobe boring	Off-site/Identify contaminant migration toward Mississippi River.	PCBs VOL Semi-vol	8 oz G. Jar 2-40 ml vials 8 oz G. Jar	Ice to 4° C Ice to 4° C Ice to 4° C	14/40 d. 14 d. 14/40 d.

TABLE 4-2
Proposed Sample Activities
Mound Street PCB Site
St. Louis, Missouri

Sample No.	*Sample Description*	*Sample Location/Rationale*	*Analyses*	*Sample Containers*	*Preservatives*	*Holding Time*
MATRIX: Soil						
DC1CY-012	Off-site Geoprobe boring	Off-site/Identify contaminant migration toward Mississippi River.	PCBs VOL Semi-vol	8 oz G. Jar 2-40 ml vials 8 oz G. Jar	Ice to 4° C Ice to 4° C Ice to 4° C	14/40 d. 14 d. 14/40 d.
DC1CY-013[1]	Rinsate	QA/QC	PCBs VOL Semi-vol	8 oz G. Jar 2-40 ml vials 8 oz G. Jar	Ice to 4° C Ice to 4° C Ice to 4° C	14/40 d. 14 d. 14/40 d.

[1] Rinsate sample - matrix water.

PCBs - Polychlorinated Biphenyls.

VOL - Volatile organic compounds.

Semi-vol - Semi-volatile organic compounds.

14/40 d. - Extraction in 14 days, analysis in 40 days.

14 d. - Analysis in 14 days.

G. - Glass.

4.3 SURFACE WATER SAMPLING

No surface water samples are anticipated for this field activity.

4.4 SEDIMENT SAMPLING

No sediment samples are anticipated for this field activity.

4.5 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

In order to ensure the credibility of sample preparation, and quality assurance and quality control (QA/QC), this work assignment will be conducted in strict accordance with protocol approved in the ARCS Region VI-VIII Quality Assurance Management Plan (QAMP) Revision 1, March 1991. Specific organizational, audit (performance and system), and corrective action measures are addressed in the Work Plan for Site Assessment, Volume I - Technical, dated February 25, 1994. Sverdrup will perform all work on this assignment in accordance with the QAMP and the Site Assessment Work Plan. Data Quality Objectives (DQOs), applicable to this work assignment, are addressed in the QAMP, Section 5, Pages 5-1 through 5-14. Specific DQOs are outlined in Table 4-1 and addressed in this section. All appropriate technical and QA review requirements within the QAMP will be followed on this work assignment. EPA and Sverdrup/CDM Federal approved standard operating procedures (SOPs) for this activity are summarized in Table 4-3.

Five DQO Analytical Levels have been identified in the guidance document "Data Quality Objectives for Remedial Response Activities," OSWER Directive 9355.0-7B, March 1987. The DQO Analytical Level required for this investigation is DQO Level 3 which is defined as CLP-equivalent, without the rigorous documentation required of CLP RAS.

Data validation will be completed by the Region VII EPA Laboratory for CLP or in-house analysis per EPA Regional SOP 1610.3B. Data validation will address the precision, accuracy, and completeness of the data reported with respect to the following objectives.

TABLE 4-3

Standard Operating Procedure Summary

EPA Region VII SOP	*Title*
2130.2A	Field Chain-of-Custody for Environmental Samples, May 1989
2130.3A	Identification, Documentation, and Tracking of Samples
2130.6A	Sample Shipping Through the Contract Laboratory Program
OERR Directive 9345.3-02	Management of Investigation-Derived Wastes During Site Inspection, May 1991
2334.15A	Groundwater Sample Collection, November 1992
Sverdrup\CDM Federal SOP	
1-4	Subsurface Soil Sampling, September 1993
4-5	Field Equipment Decontamination at Nonradioactive Sites, June 1994

Precision

Precision refers to the reproducibility or degree of agreement among duplicate measurements of a single analyte. Analytical precision for a single analyte is expressed as a percentage of the difference between the results of duplicate samples and matrix spike/matrix spike duplicates (MS/MSD) for a given analyte, if performed. Precision requirements for this investigation will be 20% for groundwater samples and 35% for soil samples.

Accuracy

Accuracy refers to the degree of difference or agreement between measured or calculated values and the true value. The closer the agreement of the numerical value of the measured concentration to the true value, or actual concentration, the more accurate the measurement. Analytical accuracy may be expressed as the percent recovery of an analyte which has been added to the environmental sample at a known concentration before analysis. The CLP lab will determine accuracy for this investigation.

Completeness

Completeness is defined as the number of measurements judged valid compared to the number of measurements needed to achieve a specified level of confidence in decision making. A completeness objective of 90% has been assigned to this investigation. One groundwater sample and three subsurface soil samples are required to complete this investigation.

Representativeness

Representativeness is ensured by collecting a sufficient number of samples of a specific environmental medium, properly chosen with respect to location and time. The precision of a representative set of samples reflects the degree of variability (or homogeneity) of the sampled medium as well as the effectiveness of the sampling techniques and laboratory analyses.

Comparability

Comparability will be achieved by adhering to EPA Region VII sampling protocols, or CDM\Sverdrup sampling protocols where no EPA SOPs exist, and EPA analytical test methods, and by the use of QC samples. The completeness goal for the Mound Street PCB Site SSI will be 90%. Failure to meet these requirements will result in qualification of the data, nonuse of the data, or resampling.

A total of three QA/QC samples will be collected during field activities (Table 4-4); one soil duplicate (DC1CY-003D), one water duplicate (DC1CY-008D), and one soil rinsate (DC1CY-013). In addition, one trip blank (DC1CY-004F) and one field blank (DC1CY-005F) will be prepared by the EPA laboratory and will constitute the fourth and fifth QA/QC samples.

A trip blank will be required since VOCs are being analyzed. The rinsate and field blank QA/QC samples will be analyzed for the same parameters as the site samples. Any deviations from the approved Work Plan will be noted in the field logbook.

TABLE 4-4

SSI Field QC Samples

Type of Sample	*Purpose*
Field Duplicate (DC1CY-003D & DC1CY-008D)	This sample estimates medium homogeneity and sampling precision. The duplicate samples will be collected at a designated sample location to measure sample homogeneity and precision.
Trip Blank (DC1CY-004F)	Trip blank or transport blank is prepared from a contaminant-free media prior to the SSI in an actual sample container and kept unopened with site samples throughout the field investigation. The trip blank will be used to measure potential cross contamination during the entire process of collecting, shipping, and storing samples. Trip blanks are required only for volatile organics analysis.
Field Blank (DC1CY-005F)	Contaminant-free medium, that is either transferred from one container to another in the field or simply exposed to the environmental field conditions. These samples will be used as an indicator of sample contamination during the entire process, including sampling, transport, sample preparation, and analysis.
Rinsate (DC1CY-013)	A rinsate will be used to verify decontamination procedure. Sample will be prepared by running DI water over decontaminated sampling equipment and collecting the rinse water in a sample container.

4.6 FIELD ACTIVITIES

Field personnel are scheduled to travel to the site on March 18, 1996. Site access will be verified at least two weeks prior to the sampling event. All environmental samples and nonsampling information will be collected within a 3-day period.

Field work will begin with a site reconnaissance to verify access to proposed sampling locations. During sampling activities, personal sampling pumps will be used to determine the exposure to dust. A drive-by survey will be completed prior to departing the site, to verify the location of wetlands, surface water drainage, closest residence, and private wells located within one-half mile of the site. Upon completion, all samples will be prepared and packaged for shipping to the EPA Region VII Laboratory. The expected sample delivery date is March 21, 1996 via Federal Express courier or hand delivery.

A 2-person team will be utilized for sample collection. The Site Manager will be a part of this team. Sampling will occur after EPA Region VII review and approval of the FSP.

Sampling will commence with the collection of groundwater samples. Groundwater samples will be collected after well purging is complete. Soil samples will be collected utilizing a geoprobe. Nonsampling data collection will occur after all other sampling has been completed.

All samples collected will be analyzed for the specified parameters. Sample collection will be completed according to EPA Region VII SOPs or CDM\Sverdrup SOPs as summarized in Table 4-3.

4.7 QUALITY CONTROL PROCEDURES

Sampling equipment utilized will be decontaminated utilizing a phosphate free detergent and deionized water as described in the CDM/Sverdrup SOP, attached as Appendix D. All samples collected will be maintained under strict chain-of-custody within designated sample coolers. Water samples requiring volatile organic compound analysis will be preserved with HCl and stored at 4° C ± 2° C. Soil samples will also be stored at 4° C. Samples will be shipped via Federal Express Priority overnight mail service to the EPA Region VII Laboratory for analysis.

The address for sample shipments will be:

Attention: Sample Custodian
U. S. EPA Region VII Laboratory
25 Funston Road
Kansas City, Kansas 66115

5.0 INVESTIGATION DERIVED WASTE (IDW)

Disposable sampling equipment (i.e., aluminum pans and bowls, stainless steel spoons, personal protective gear such as Tyveks, overboots, and gloves) will be double bagged onsite, and disposed of in accordance with the Office of Emergency and Remedial Response (OERR) Directive 9345.3-02 (EPA 1991).

Sampling and decontamination methods have been designed in order to minimize the unnecessary generation of IDW. SSI activities conducted by Sverdrup will have minimum impact on the site and leave the site in compliance with Applicable or Relevant and Appropriate Requirements (ARARs). The Site Manager will be responsible for using sound professional judgement when making decisions regarding IDW.

The following are the onsite handling options available to the Site Manager when the IDW is considered Resource Conservation and Recovery Act (RCRA) nonhazardous:

- For soil cuttings:
  - Spread around the borehole,
  - put back into the boring
  - put into a pit within the area of concern (AOC), or
  - dispose of at the site's Treatment or Disposal Unit (TDU).
- For groundwater:
  - Pour onto ground next to well to allow infiltration, or
  - dispose of at the site's TDU.
- For decontamination fluids:
  - Pour onto ground (from containers) next to well to allow infiltration, or
  - dispose of at the site's TDU.
- For Personal Protective Equipment (PPE) and Decontamination Equipment:
  - Double bag and deposit in any municipal landfill, or
  - dispose of at the site's TDU.

6.0 PROJECT MANAGEMENT

The Sverdrup Project Manager, Michael W. McCurdy, CHMM, for this SSI will be responsible for scheduling field activities and assigning the appropriate personnel required to complete all required SSI tasks. Site management responsibilities will include overseeing all field activities at the project site and will be conducted by Mr. McCurdy. These responsibilities will include sample collection, sample packaging shipment, and field documentation. The Site Health and Safety Officer will be determined at a later date for the site investigation activities. Section 1.0 of the Work Assignment Work Plan details the proposed key personnel for completing site assessment activities tasked under this work assignment. This document is entitled "Work Plan for Site Assessment, Volume I - Technical. February 25, 1994."

6.1 FIELD EQUIPMENT/HEALTH AND SAFETY

Soil sampling activities are to be conducted in Level C. Level C will consist of surgical gloves, boot covers, steel toed boots, full-face respirator with chlorinated organic cartridges, and personal sampling pumps. Groundwater sampling activities, plus non-sampling activities at the site, will be conducted in Modified Level D. Modified Level D will consist of surgical gloves, boot covers, steel toed boots, and personal sampling pumps. Other items required for this investigation include sample containers, sample equipment, and decontamination equipment (sediment sampling only).

6.2 COMMUNITY RELATIONS

The property owners have been made aware of sampling activities and the field schedule. All inquires about project activities will be referred to the U. S. EPA Region VII Superfund Regional Work Assignment Manager and Site Assignment Manager.

6.3 PROJECT SCHEDULE/BUDGET

Site investigation field work will commence on March 18, 1996, and end on March 20, 1996. Field samples will be collected on March 18, 19 and 20. Samples will either be shipped to the EPA Region VII Laboratory for arrival on March 21, 1996, or will be hand delivered. Routine Analytical Services, 8-week analytical turnaround time, will be requested from the laboratory. After completion of field work, a trip report will be generated which will detail any deviations from this sampling plan and field sampling activities completed. The Screening Site Inspection (SSI) Report will be submitted to EPA as a draft within 30 days of receipt of the complete data transmittal from EPA. Table 6-1 provides a summary of Level of Effort (LOE) per milestone to be expended for this SSI.

TABLE 6-1
SSI Budget/Schedule
Mound Street PCB Site

Milestone	*Cumulative Budget (Hrs.)*	*Milestone Date*
Management Work Plan to EPA	20	10-12-95
Site Reconnaissance	60	12-6-95
Trip Report	85	12-15-95
Sample Strategy Scoping Meeting	100	12-20-95
Field Sampling Plan to EPA	150	1-29-96
Field Work (including preparation activities)	260	3-20-96
Trip Report to EPA	280	3-27-96
Draft SSI Report to EPA	420	6-3-96
EPA Comments Due	440	7-3-96
Final SSI Report to EPA	460	7-26-96
SSI Completion Date	470	8-29-96

BUDGET: After completion of this milestone, no more cumulative hours than listed will have been used.

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APPENDIX A

SUMMARY OF LACLEDE COAL GAS SSI ANALYTICAL RESULTS

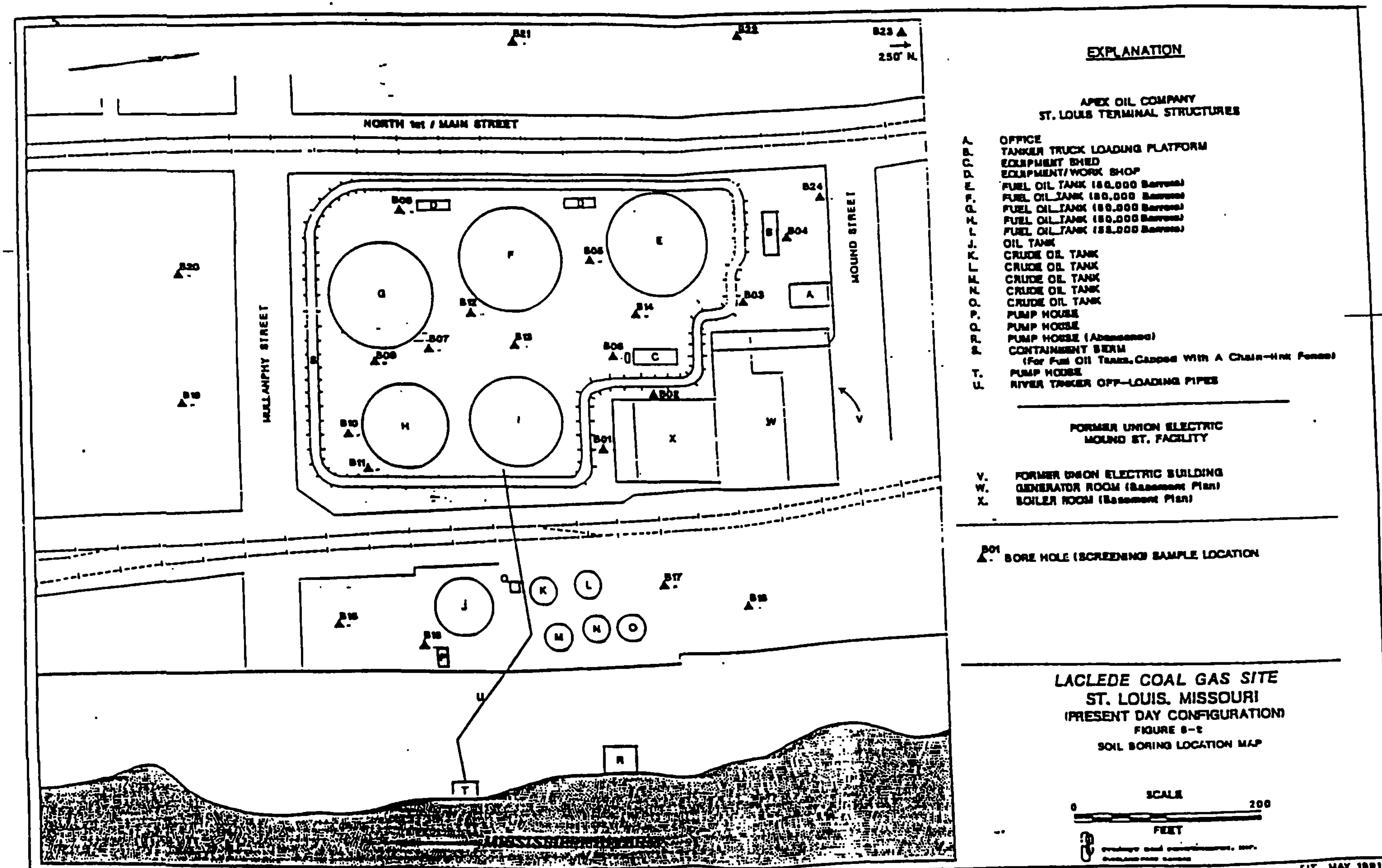
SECTION 6: FIELD ACTIVITIES

Field work was conducted March 3 through 9, 1991. The sample series assigned to this activity was DSX44. The FIT members and their respective tasks were: Keith Brown, Team Leader; Anne Melia, FASP coordinator; Chris Williams, Geoprobe operator and sampler; Patty Roberts, Assistant Geoprobe operator and sampler; Wes McCall, drilling supervisor and Site Safety Officer; John Peck, sampler and health and safety monitor; and Jon Strobel, sampler and assistant FASP coordinator. The FIT contracted John Mathes & Associates, Inc. to conduct all subsurface drilling. On-site personnel for John Mathes & Associates, Inc. were: Keith Bunselmyer, driller; and Jeff Crank and Jim Burker, driller's assistants. Additionally, William Oberle and Jacalyn Wheeler, E & E/FIT, were present on site March 6 and 7, 1991, to conduct a health and safety, and technical field audits.

The primary chemical hazards associated with the Laclede Coal Gas site involve soils contaminated with cyanide salts and/or PAHs. These materials could pose inhalation, direct contact, and ingestion hazards. Samples were collected in level-D and level-C personal protection. An HNu photo-ionization detector with 10.2 eV probe was used to monitor ambient levels of volatile compounds in the breathing zone. If the HNu registered readings above predetermined action levels, personal protection was upgraded to level-C. Otherwise, samples were collected in level-D personal protection.

6.1 SUBSURFACE SOIL SAMPLING

Subsurface soil sampling was conducted March 4 through 9, in an attempt to determine the areal and vertical extent of subsurface contamination. Initially, 24 locations were drilled with solid stem augers (Figure 6-1; Table 6-1). Their depths ranged from 2 feet to 38 feet. Originally, the work plan called for 18 locations to be drilled with solid stem augers to approximately 20 foot depths, with the exception of 1 location which was to be drilled to 50 feet deep. This deep sample was intended to determine the depth to bedrock and help assess the vertical contaminant zone. The 6 additional locations were added because subsurface rubble prohibited the advancement of the augers



LACLEDE COAL GAS SITE
ST. LOUIS, MISSOURI
(PRESENT DAY CONFIGURATION)
FIGURE 8-2
SOIL BORING LOCATION MAP

WASTE SITE TRACKING NO.: MO0579

Table 6-1
Borehole Summary
Laclede Coal Gas
St. Louis, Missouri
Sample Series DSX44
March 1991

Borehole #	Depth (ft)	Approximate Location
B01	18	South of former Mound Street Power Plant
B02	21	Southwest of former Mound Street Power Plant
B03	19	South of P, F, & T Office
B04	19	North of tanker truck loading platform
B05	26	Approximately 15 feet south of northern-most fuel oil tank
B06	38	North of center of site within containment berm
B07	29	South of center of site within containment berm
B08	--	Southwest corner of site within containment berm
B09	--	South of center of site within containment berm
B10	--	Southeast corner of site within containment berm
B11	15	Southeast corner of site within containment berm
B12	11	Center of site within containment berm
B13	10	Center of site within containment berm
B14	26	North center of site within containment berm
B15	31	Southeast corner of site
B16		Southeast corner of site approximately 100 feet north of B15
B17	33	Northeast corner of site
B18	33	Northeast corner of site approximately 150 north of B17
B19	30	South of Mullanphy Street
B20	30	South of Mullanphy Street approximately 200 feet north of B19
B21	--	Approximately 80 feet north of North 1st Street
B22	--	Approximately 300 feet north of B21
B23	--	Approximately 450 feet north of B22
B24	23	Northeast corner of site

Note: See Figure 6-1 for borehole locations.

at several locations to only a few feet and, therefore, a representative sample could not be collected.

Samples were collected off the auger flights and screened on site for PAHs and VOCs in the FASP mobile laboratory (Tables 6-2 and 6-3). The samples were collected at 5 foot intervals: the PAH sample was a composite of 5 aliquots, 1 collected every foot; the VOC sample was a grab sample. Four of the sample locations determined by FASP analysis to be the most contaminated were resampled as follows: hollow stem augers equipped with continuous samplers were advanced, offset 1 to 5 feet from the screening boring (Figure 6-2, Table 6-4). A background location was sampled in the same manner. Due to subsurface rubble and debris, the continuous sampler could not be utilized at all locations. A split spoon sampler equipped with a 140 pound hammer was used at locations where the continuous sampler would not work. Samples were collected according to E & E, Inc. Standard Operation Procedures (SOPs) for borehole sampling, Gentech 5.9. Samples from the 4 locations that were resampled were submitted to EPA for volatiles, semi-volatiles, cyanides, and total metals analysis.

The background samples were inadvertently discarded along with the screening samples. This was not discovered by FIT until the SSI was completed and the team had returned to Kansas City. Split samples had been collected at all locations where samples were submitted to the EPA and which were also on PF & T property. Kathy Enright, of E & E/TAT in St. Louis, Missouri, sent the split samples collected for PF & T to E & E's Kansas City office. These samples were once again split, and 1 set was submitted to EPA to be used as the background sample. The other set was returned to PF & T.

The background samples were collected at a different location than stated in the work plan because bedrock was encountered at approximately 2 feet below the surface at this location; therefore, subsurface soil samples could not be collected there. FASP analysis had revealed that borehole #B24, the farthest upgradient screening sample, was below detection limits for all target compounds. It was known that the depth to bedrock was approximately 20 feet. Therefore, E & E/FIT relocated

Table 6-2
FASP Screening Results for Volatiles
LaClede Coal Gas
St. Louis, Missouri
Sample Series DSX44
March 1991

Sample #	Benzene (µg/kg)	Toluene (µg/kg)	M-xylene (µg/kg)	Depth (feet)
B01 A	1,200	380	1,700	0 - 5
B01 B	9,100	1,200	19,000	5 - 10
B01 C	18,000	710	65,000	10 - 15
B01 D	17,000	770	79,000	15 - 18
B02 A	6,300	43,000	240,000	0 - 5
B02 B	6,100	1,700	57,000	5 - 10
B02 C	69,000	110,000	570,000	10 - 15
B02 D	7,500	650	33,000	15 - 21
B03 A	1,040	22,000	22,000	0 - 5
B03 B	310	11,000	53,000	5 - 10
B03 C	1,800	6,300	3,500	10 - 15
B03 D	860	9,000	5,300	15 - 19
B04 A	< 250	450	5,600	0 - 5
B04 B	310	480	5,900	5 - 10
B04 C	< 250	250	5,100	10 - 15
B04 D	< 250	ND	440	15 - 19
B05 A	460	ND	ND	0 - 5
B05 B	ND	ND	ND	5 - 10
B05 C	ND	ND	420	10 - 15
B05 D	ND	ND	410	15 - 20
B05 E	ND	ND	ND	20 - 26
B06 A	48,000	1,700	120,000	0 - 5
B06 B	20,000	1,800	68,000	8 - 10
B06 BA	93,000	120,000	220,000	0 - 5
B06 BB	27,000	91,000	260,000	5 - 10
B06 BC	ND	ND	ND	10 - 15
B06 BD	< 250	< 250	ND	15 - 20
B06 BE	12,000	14,000	54,000	20 - 25
B06 BF	43,000	66,000	23,000	25 - 30
B06 BG	20,000	16,000	26,000	30 - 35
B06 BH	29,000	43,000	94,000	35 - 38
B07 A	1,000,000	17,000	2,500,000	3 - 8
B07 B	670,000	12,000	2,100,000	8 - 13
B07 C	370,000	ND	> 1,200,000	13 - 18
B07 D	140,000	2,500	> 21,000,000	18 - 23
B07 E	22,000	490	120,000	23 - 26
B07 F	51,000	2,800	340,000	26 - 29
B10 B	< 250	410	ND	5 - 10
B11 A	ND	ND	ND	0 - 5

Table 6-2 (cont.)

Sample #	Benzene (µg/kg)	Toluene (µg/kg)	M-xylene (µg/kg)	Depth (feet)
B11 B	ND	ND	ND	5 - 10
B11 C	ND	ND	ND	10 - 15
B12 A	< 250	< 250	1,500	0 - 5
B12 B	910	1,600	4,400	5 - 11
B13 A	570	420	< 250	0 - 5
B13 B	670	450	2,300	5 - 10
B14 A	270,000	11,000	> 160,000	2 - 8
B14 B	790	9,100	> 24,000	8 - 13
B14 C	400,000	14,000	> 160,000	13 - 18
B14 D	340,000	12,000	> 210,000	18 - 23
B14 E	310,000	8,900	> 195,000	23 - 26
B14 F	2,200,000	63,000	> 1,000,000	---
B14 SS	93,000	110,000	440,000	---
B15 A	680	490	> 29,000	0 - 5
B15 B	290	ND	10,000	5 - 10
B15 C	< 250	ND	7,400	10 - 15
B15 D	< 250	ND	2,700	15 - 20
B15 E	ND	ND	ND	20 - 25
B15 F	ND	ND	ND	25 - 31
B16 A	820	860	15,000	0 - 3
B17 A	540	ND	21,000	0 - 5
B17 B	ND	ND	2,700	5 - 10
B17 C	ND	ND	ND	10 - 15
B17 D	ND	ND	ND	15 - 20
B17 E	ND	ND	ND	20 - 25
B17 F	ND	ND	ND	25 - 30
B17 G	ND	ND	ND	30 - 33
B18 A	< 250	ND	ND	0 - 5
B18 B	ND	ND	ND	5 - 10
B18 C	ND	ND	ND	10 - 15
B18 D	ND	ND	ND	15 - 20
B18 E	ND	ND	ND	20 - 25
B18 F	ND	ND	ND	25 - 30
B18 G	ND	ND	ND	30 - 33
B19 A	ND	ND	ND	0 - 5
B19 B	ND	ND	ND	5 - 10
B19 C	ND	ND	ND	10 - 15
B19 D	ND	ND	ND	15 - 20
B19 E	ND	ND	ND	20 - 25
B19 F	ND	ND	ND	25 - 30
B20 A	320	ND	ND	0 - 5
B20 B	ND	ND	ND	5 - 10
B20 C	ND	ND	ND	10 - 15
B20 D	ND	ND	ND	15 - 20

Table 6-2 (cont.)

Sample #	Benzene (µg/kg)	Toluene (µg/kg)	M-xylene (µg/kg)	Depth (feet)
B20 E	ND	ND	ND	20 - 25
B20 F	ND	ND	ND	25 - 30
B22 A	ND	ND	ND	---
B23 A	ND	ND	ND	0 - 4
B24 A	ND	ND	ND	0 - 5
B24 B	ND	ND	ND	5 - 10
B24 C	< 250	ND	ND	10 - 15
B24 D	400	ND	550	15 - 20
B24 E	460	ND	430	20 - 23
401	ND	ND	ND	N/A
402	ND	ND	1,600	N/A
403	< 250	< 250	420	N/A
301	ND	ND	ND	N/A
302	ND	ND	ND	N/A
303	ND	ND	ND	N/A
304	ND	ND	ND	N/A
DW 1	188	77	1,000	N/A
DW 2	330	48	1,100	N/A
CDW	ND	ND	ND	N/A
SS-Rinsate	ND	ND	ND	N/A

Note: Detection limit for soil/sediment samples = 250 µg/kg. Detection limit for water samples = 25 µg/L. See Figures 6-1 and 6-2 for sample locations.

B01 A through B24 E = soil samples
401 through 403 = sediment samples
301 through 304 = surface water samples
DW = decon water (units are µg/L)
CDW = clean decon water
ND = no detection
N/A = not applicable
SS = split spoon

Table 6-3
FASP Screening Results for PAHs
LaClede Coal Gas
St. Louis, Missouri
Sample Series DSX44
March 1991
Reported in µg/kg

Sample #	Fluor-anthene	Pyrene	Benzo(k) fluoranthene	Benzo(a) pyrene	Comments
B01 A	16,000	3,700	NA	NA	
B01 B	27,000	12,000	NA	NA	
B01 C	56,000	40,000	NA	NA	
B01 D	13,000	5,200	NA	NA	
B02 A	8,000	ND	ND	ND	
B02 B	15,000	ND	ND	ND	
B02 C	ND	ND	ND	ND	
B02 D	ND	ND	ND	ND	
B03 A	ND	ND	ND	ND	
B03 B	ND	ND	ND	ND	
B03 C	ND	ND	ND	ND	
B03 D	ND	ND	ND	ND	
B04 A	ND	ND	ND	ND	
B04 B	12,000	ND	ND	ND	
B04 C	9,000	ND	ND	ND	
B04 D	< 500	ND	ND	ND	chyrsene & benzo(a) anthracene = 1,200
B05 A	ND	ND	ND	ND	
B05 B	ND	ND	ND	ND	
B05 C	ND	ND	ND	ND	
B05 D	ND	ND	ND	ND	two unknown peaks
B05 E	ND	ND	ND	ND	
B06 A	55,000	110,000	54,000	40,000	anaphthalene, fluorene, anthracene, chrysene
B06 B	Blew out GC, peaks too large to integrate				
B06 BA	ND	ND	ND	ND	
B06 BB	ND	ND	ND	ND	
B06 BC	ND	ND	32,000	11,000	other identified peaks
B06 BD	ND	ND	ND	ND	
B06 BE	ND	ND	ND	ND	
B06 BF	ND	ND	ND	ND	
B06 BG	ND	ND	ND	ND	
B06 BH	17,000	ND	ND	ND	
B07 A	Peaks too large to integrate, no time to reanalyze				
B07 B	160,000	50,000	50,000	70,000	other PAHs present
B07 C	130,000	130,000	33,000	76,000	other PAHs present
B07 D	12,000	9,600	3,700	3,900	
B07 E	3,300	3,800	3,500	3,000	other PAHs present
B07 F	20,000	19,000	4,200	8,000	other PAHs present
B10 B	14,000	16,000	7,800	9,100	other PAHs present

Table 6-3 (cont.)

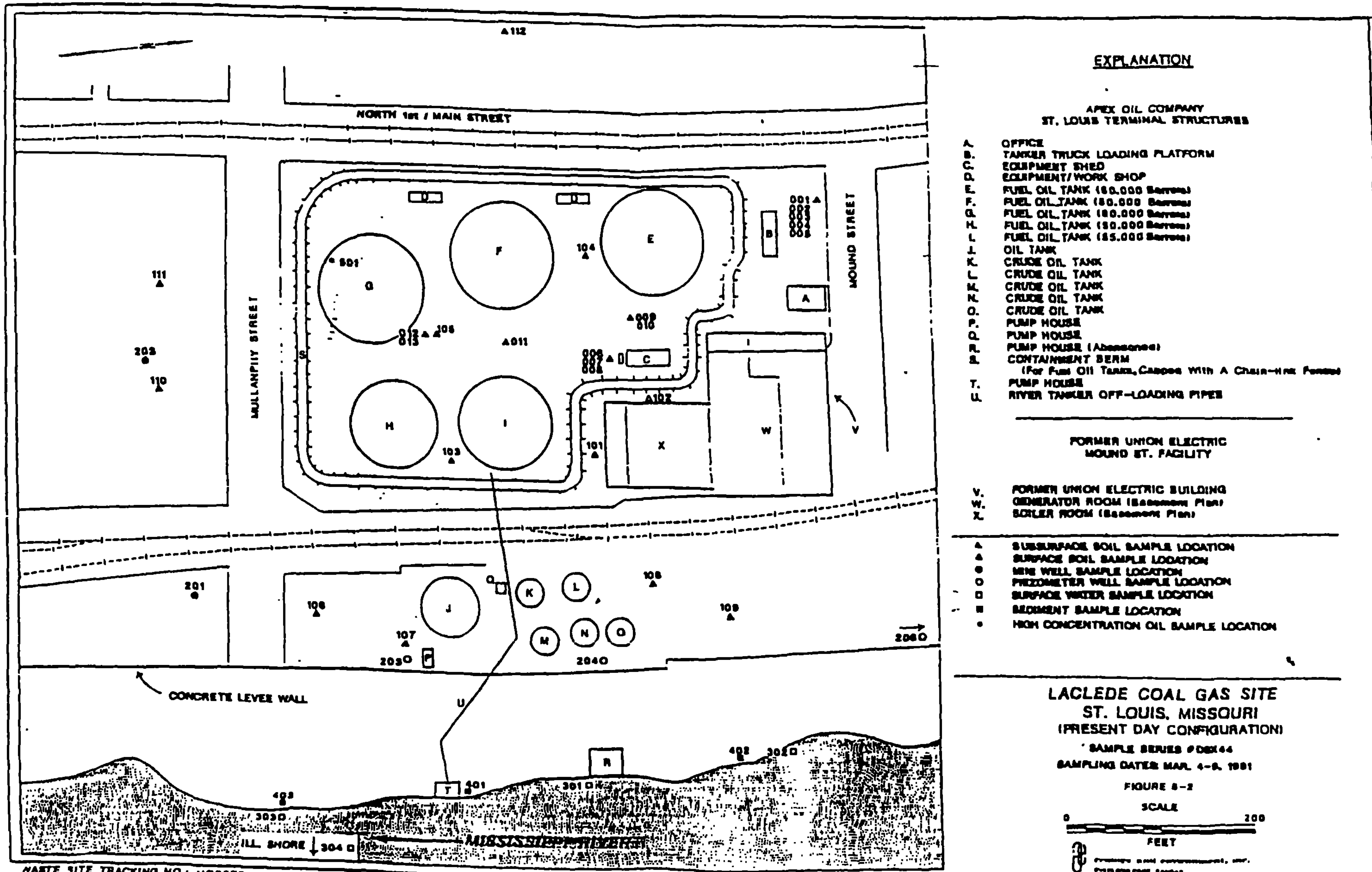
B11 A	2,400	1,600	4,200	ND	other PAHs present
B11 B	?,100	2,100	7,000	10,000	other PAHs present
B11 C	7,800	ND	6,000	12,000	
B12 A	14,000	12,000	14,000	15,000	
B12 B	38,000	29,000	12,000	15,000	
B13 A	150,000	73,000	46,000	44,000	
B13 B	12,000	10,000	10,000	12,000	
B13 C	32,000	34,000	28,000	32,000	
B14 A	1,600,000	580,000	280,000	63,000	other identified peak
B14 B	2,200,000	1,000,000	370,000	310,000	other identified peak
B14 C	4,200,000	1,600,000	1,200,000		other identified peak
B14 D	4,300,000	1,300,000	490,000		other identified peak
B14 E	3,200,000	4,100,000	1,500,000	140,000	other identified peak
B14 F	Blew out GC, peaks too large to integrate				
B14 SS	1,400,000	880,000	230,000	130,000	
B15 A	ND	ND	ND	ND	
B15 B	4,900	1,300	ND	ND	
B15 C	ND	ND	ND	ND	
B15 D	ND	ND	ND	ND	
B15 E	ND	ND	ND	ND	
B15 F	ND	ND	ND	ND	
B16 A	19,000	30,000	ND	ND	early peaks
B17 A	ND	ND	ND	ND	
B17 B	ND	ND	ND	ND	
B17 C	ND	< 500	ND	ND	
B17 D	ND	ND	ND	ND	
B17 E	ND	ND	ND	ND	
B17 F	ND	ND	ND	ND	
B18 A	ND	ND	ND	ND	
B18 B	ND	ND	ND	ND	
B18 C	ND	ND	ND	ND	
B18 D	ND	ND	ND	ND	
B18 E	ND	ND	ND	ND	
B18 F	ND	ND	ND	ND	
B18 G	ND	ND	ND	ND	
B19 A	ND	ND	ND	ND	
B19 B	ND	ND	ND	ND	
B19 C	ND	ND	ND	ND	
B19 D	ND	ND	ND	ND	
B19 E	18,000	16,000	14,000	12,000	
B19 F	4,500	ND	2,800	ND	
B20 A	ND	2,900	< 500	ND	
B20 B	4,100	4,000	ND	545	
B20 C	ND	ND	ND	ND	
B20 D	ND	ND	ND	ND	
B20 E	ND	ND	ND	ND	
B20 F	2,600	3,200	3,500	4,500	
B22 A	3,800	3,500	2,800	ND	

Table 6-3 (cont.)

B23 A	ND	ND	ND	ND	
501	--	--	--	--	peaks close to retention time, but do not match
402	ND	ND	ND	ND	
403	2,600	5,400	4,200	3,800	
DDW	ND	ND	ND	ND	no peaks (μg/L)
SS Rinsate	ND	ND	ND	ND	no peaks (μg/L)
B24 A	ND	ND	ND	ND	
B24 B	ND	ND	ND	ND	
B24 C	ND	ND	ND	ND	
B24 D	ND	ND	ND	ND	
B24 E	ND	ND	ND	ND	

Note: Sample locations are shown on Figures 6-1 and 6-2. Sample 501 is an oil sample collected from tank #7, shown on Figure 6-2. Detection limits for soil/sediment = 500 μg/kg. Detection limits for water samples = 15 μg/l.

DDW = dirty decon water
SS = split spoon
NA = not analyzed
ND = not detected



WASTE SITE TRACKING NO.: MO0579
PREPARED BY: K. BROWN

FIT MAY 1991

Table 6-4
CLP Soil/Sediment Sample Summary
LaClede Coal Gas
St. Louis, Missouri
Sample Series DSX44
March 1991

Sample #	Depth (feet)	Location Description
001	3 - 7	5 feet northwest of B24
002	7 - 11	5 feet northwest of B24
003	11 - 15	5 feet northwest of B24
004	15 - 19	5 feet northwest of B24
005	19 - 23	5 feet northwest of B24
006	3 - 8	2.5 feet north of B06
007	8 - 13	2.5 feet north of B06
008	8 - 12	2 feet south of B06
009	4 - 8	3 feet northwest of B14
010	12 - 14	3 feet northwest of B14
011	11 - 17	1.5 feet west of B07
012	5 - 11	1 foot north of B13
013	11 - 12.5	1 foot north of B13
101	0 - 2	B01
102	0 - 2	B02
103	0 - 2	South central tank farm
104	0 - 2	B05
105	0 - 2	B07
106	0 - 2	B15
107	0 - 2	B16
108	0 - 2	B17
109	0 - 2	B18
110	0 - 2	B19
111	0 - 2	B20
112	0 - 2	B21
401	N/A	150 feet south of southeast corner of the abandoned pump house
401D	N/A	150 feet south of southeast corner of the abandoned pump house
402	N/A	110 feet north of northeast corner of the abandoned pump house
403	N/A	330 feet south of southeast corner of the abandoned pump house

Note: Samples 001 through 013 collected from five aliquots, except VOCs were grab samples. Samples 101 through 112 collected from two aliquots. All samples were submitted to EPA for cyanide, semi-volatiles, and total metals analyses. Samples 001 through 113 and 401 through 403 were also analyzed for volatiles. Samples 401 through 403 were also analyzed for total petroleum hydrocarbons. See Figure 6-2 for sample locations.
D = Duplicate
N/A = Not applicable

the background sample location to the farthest northwest corner of PF & T property. This location is approximately 60 feet northwest (upgradient) of borehole #B04 (Figure 6-1).

6.2 SURFACE SOIL SAMPLING

Surface soil sampling was conducted March 4 through 7, to determine whether contamination was present in the 0- to 2-foot interval. Twelve samples were collected (Figure 6-2, Table 6-4). According to the work plan, these samples were to be collected using a power auger. However, due to excessive amounts of gravel and rubble present, the power auger could not be used efficiently. Therefore, all but one surface soil sample was collected with the subcontractor's drill rig.

Each sample was collected off the auger flights and consisted of two aliquots collected from one- and two-foot depths. The sample not collected with the drill rig was obtained with the use of the power auger. Three of the 12 surface soil samples collected, 110, 111, and 112, were inadvertently discarded along with the screening samples. Keith Brown and Scott Hayes returned to the site on March 13 and 14 and recollected these samples with a power auger. All samples were submitted to EPA for semi-volatile, cyanide, and total metals analyses. Samples were collected in accordance with the Region VII E & E/FIT SOP for soil sample collection, Geotech 5.17.

6.3 GROUND WATER SAMPLING

Ground water sampling was conducted March 5 through 9, to determine whether any coal tar wastes present have leached into the shallow ground water or migrated off site via the ground water. A total of 9 samples, including a duplicate, field blank, rinsate, and extra volume sample were collected (Figure 6-2, Table 6-5). The work plan called for the installation of 4 temporary mini-wells with the Geoprobe. Due to subsurface rubble, only 2 mini-wells were installed. However, the Corps of Engineers (COE) has installed piezometer wells along the west side of the Mississippi River levee wall. The COE wells located just east of the site were sampled with the use of the Geoprobe vacuum system. One other COE piezometer well was sampled; it is located approximately 1,500 feet north (upgradient) of the site along the levee wall. This location

Table 6-5
Water Sampling Summary
LaClede Coal Gas
St. Louis, Missouri
Sample Series DSX44
March 1991

Sample #	Depth (feet)	Static Water Level (SWL) (feet)	Location/Description
201	26	24	64 feet south from center of Mullanphy Street and 50 feet east of easternmost railroad
202	33	24	147 feet west of easternmost railroad and 78 feet south of center of Mullanphy Street
203	47.25	27.25	147 feet north of center of Mullanphy Street and 40 feet west of levee wall
204	48	26	363 feet north of center of Mullanphy Street and 25 feet west of levee wall
205F	N/A	N/A	Rinsate of augers and split spoon sampler
206	52	29	2,118 feet north of center of Mullanphy Street and 20 feet west of levee wall
206D			Duplicate of 206
207F	N/A	N/A	Field Blank
208	N/A	N/A	Geoprobe pipe rinsate sample
209F	N/A	N/A	Trip blank
301	Surface	N/A	Southeast corner of abandoned pump house
301D	Duplicate of above		
302	Surface	N/A	170 feet north of northeast corner of abandoned pump house
303	Surface	N/A	330 feet south of southeast corner of abandoned pump house
304	Surface	N/A	Illinois American drinking water intake in East St. Louis
304D			Duplicate of 304
501	Surface	N/A	Oil sample collected from PF & T tank #80-1

Note: See legend on next page.

Legend for Table 6-5

Note: Sample locations are shown on Figure 6-2. All water samples were submitted to EPA for volatiles, semi-volatiles, and total and dissolved metals analyses. Samples 301 through 304D were also analyzed for Total Petroleum Hydrocarbons. Sample #501 is an oil sample which was submitted to EPA for Total Petroleum Hydrocarbons, volatiles, and semi-volatiles analyses. Cyanide samples were preserved with sodium hydroxide. Metals samples were preserved with nitric acid.

D = duplicate
F = field blank or trip blank
N/A = not applicable

was chosen for the ground water background sample. The original background location could not be sampled because bedrock was only 2 feet deep. All samples were collected following the E & E Region VII SOP for ground water collection, Gentech 5.11. Total and dissolved metals samples were preserved with nitric acid; cyanide samples were preserved with sodium hydroxide; and all samples were stored on ice. Samples were delivered to EPA for volatiles, semi-volatiles, cyanide, total metals, and dissolved metals analyses. The field parameters, temperature, pH, and conductivity were measured and recorded in the field (Table 6-6).

6.4 SURFACE WATER/SEDIMENT SAMPLING

Surface water/sediment sampling was conducted March 6 through 7 to determine whether contaminants have migrated via the ground water/surface water interface. A total of 6 surface water samples were collected, including 2 duplicates (Figure 6-2, Table 6-5). All samples were collected according to the EPA Region VII SOP for surface water sample collection, 2334.7A. Samples were submitted to EPA for Total Petroleum Hydrocarbons, volatiles, semi-volatiles, cyanide, total metals, and dissolved metals analyses. Total and dissolved metals samples were preserved with nitric acid, cyanide samples were preserved with sodium hydroxide, and all samples were stored on ice. The field parameters temperature, pH, and conductivity, were measured and recorded in the field (Table 6-6).

A total of 4 sediment samples were collected, including a duplicate (Figure 6-2, Table 6-4). All samples were collected according to the EPA Region VII SOP for sediment sample collection, 2334.8A. Samples were submitted to EPA for Total Petroleum Hydrocarbons, volatiles, semi-volatiles, cyanide, and total metals analyses. Surface water and sediment samples were screened on site in the mobile lab for the presence of PAHs and VOCs (Tables 6-2 and 6-3).

6.5 PRODUCT SAMPLING

One oil sample was to be collected from the basement of the former Mound Street Power Plant, if the building was standing and oil was present in the basement. At the time of the SSI, the building was in the process of being razed. Due to the danger involved with entering

Table 6-6
Field Parameters for Water Samples
LaClede Coal Gas
St. Louis, Missouri
Sample Series DSX44
March 1991

Sample #	Temperature (C°)	pH	Conductivity (umhos)
301	7	8.15	440
301D	7	8.15	440
302	6	7.87	450
303	6	7.27	360
304	3	7.05	350
304D	3	7.05	350
201	11	7.58	1,500
202	7	7.81	2,000
203	9	6.32	1,500
204	9	6.21	1,400
206	11	6.14	1,600
206D	11	6.14	1,600
207F	--	---	--
208	4	7.00	16
209F	--	----	--

Note: See Figure 6-2 for sample locations.

this building, the sample was not collected. However, an oil sample (sample 501) was collected from an 80,000-gallon tank on site (Figure 6-2). This tank contained #6 oil, the same type of oil that was spilled in 1986 and entered the basement of the former power plant. This oil sample was submitted to EPA for total petroleum hydrocarbons, VOCs, and semi-volatiles analyses. It was also screened on site in the mobile lab. The chromatogram peaks were close to the retention times for the contaminants being screened, but did not match (Table 6-3).

SECTION 7: ANALYTICAL RESULTS

7.1 SURFACE SOIL SAMPLES (0-2 FEET)

The surface soil (0-2 feet) sampling data indicated that the majority of the 7-acre site is significantly contaminated with cyanide at greater than three times the detection limit of the background sample 112 (Figure 6-2; Table 7-1). Analysis of off site samples 110, 111, and 112 revealed no cyanide contamination over their detection limits of 6.2, 6.2, and 6.7, respectively (Figure 6-2).

Surface soil PAH contamination was less extensive than the surface soil cyanide contamination. Four out of the 12 samples collected contained a total PAH content greater than five times the concentration of the background sample. These were samples 104, 105, 107 and 109 (Figure 6-2; Table 7-1).

The cyanide contamination found on site can be attributed to the FMGP based on the fact that cyanide is an oxide waste produced during the gas purification process (see Section 4 for details). There should not be any attribution from current on site activities, because cyanide is not a constituent normally found in oil or asphalt.

Attribution of PAH contamination in the surface soil samples is difficult to assess. The oil sample data indicated significant concentrations of many PAH compounds (Appendix D, Sample 501). PF & T currently stores #6 oil and asphalt on site in very large quantities. In 1986, PF & T experienced a spill of said oil which covered most of the site. Thus, surface soil PAH contamination could be attributed to PF & T activities or to the FMGP, based on the fact that it was common practice for FMGPs to bury tar and purifier waste on site. PAHs are a major constituent of coal tar waste.

7.2 SUBSURFACE SOIL SAMPLES

FASP screening results indicated that the highest PAH contamination zone was located in the central portion of the tank farm currently on site (Figure 6-1; Tables 6-2 and 6-3). The approved work plan allowed E & E/FIT to collect CLP subsurface soil samples at four locations. A total of eight samples (006-013) were collected at depths ranging from 3

Table 7-1
PAHs and Cyanide In Surface Soils
Laclede Coal Gas Site
St. Louis, Missouri
E & E/PIT; March 1991
Sample Series DSX44
(mg/kg)

Compound	101	102	103	104	105	106	107	108	109	110	111	112*
Napthalene	--	--	--	--	--	--	60	1.1	0.51	--	--	0.41U
2-Methylnaphthalene	--	--	--	--	--	--	13	2.5	--	--	--	0.41U
2-Chloronaphthalene	--	--	--	--	--	--	--	--	--	--	--	0.41U
Acenaphthylene	--	--	--	--	--	--	--	2.4	0.46	--	--	0.41U
Acenaphthene	--	--	--	--	--	--	--	0.69	--	--	--	0.41U
Fluorene	--	--	--	--	12	--	--	3.1	--	--	--	0.41U
Phenanthrene	--	--	--	20	55	1.5	--	--	2.2	1.5	0.85	0.44
Anthracene	--	--	--	--	--	--	--	--	0.78	--	--	0.41U
Fluoranthene	--	--	--	14	38	2.0	--	--	2.8	2.2	0.77	1.3
Pyrene	--	21	13	50	83	2.2	--	--	6.7	2.3	0.81	1.4
Benzo(a)anthracene	--	--	--	21	28	1.3	--	--	4.5	1.5	0.48	0.79
Chrysene	--	--	--	29	29	1.2	--	--	4.3	1.6	0.55	0.85
Benzo(b)fluoranthene	--	--	--	--	17	1.0	--	--	4.9	1.1	0.44	0.61
Benzo(k)fluroanthene	--	--	--	--	12	0.89	--	--	3.4	1.2	0.45	0.68
Benzo(a)pyrene	--	--	--	16	22	1.1	--	--	4.2	1.3	0.44	0.70
Indeno(1,2,3-CD) Pyrene	--	--	--	--	--	0.66	--	--	2.7	0.76	--	0.41U
Dibenzo(a,h)anthracene	--	--	--	--	--	--	--	--	--	--	--	0.41U
Dibenzo(g,h,i)perylene	--	--	--	--	12	0.71	--	--	2.6	0.76	--	0.41U
Total PAH Content	--	21	13	150	308	12.5	73	9.8	40.0	14.2	4.8	6.8
Cyanide	33	--	94	220	190	--	14	98	35	--	--	6.7U

* = Background sample
-- = Undetected (U); Detection limit stated for bckground sample.

Note: See Figure 6-2 for sample locations and Appendix D for complete analytical results.

to 17 feet. An additional five samples (001-005) were collected at a background location (Figure 6-2; Table 6-4). CLP data revealed significant PAH contamination at least five times greater than background concentration at all four sampling locations (Table 7-2). Cyanide contamination was found to be significant to a depth of 11+ feet (Table 7-2).

All the soil samples were also analyzed for total and dissolved metals, as well as volatiles. However, results proved to be negligible when compared to background concentrations with the exception of significant concentrations of benzene, toluene, ethyl benzene, and total xylenes (BTEX) in samples 006 through 011 (except no toluene in sample 011). Significant benzene was also detected in sample 013. Styrene (14J µg/kg) was detected in sample 012.

As was the case with the surface soil samples, the cyanide contamination can be attributed to the FMGP. It is probable that the deep soil PAH contamination came from both the FMGP and the petroleum tank farm. The presence of mixed BTEX compounds and PAHs indicates a mixed source, as volatiles are not considered abundant in coal tar.

7.3 GROUND WATER SAMPLES

Ground water sampling data indicated no significant dissolved metals contamination when compared to background concentrations. Some organics were detected; however, in sample 204, piezometer well located downgradient of the site. This sample contained 3 PAHs: acenapthalene (65 µg/L), fluorene (25 µg/L), and phenanthene (46 µg/L); and 93 µg/L benzene (Figure 6-2; Appendix C). Additionally, cyanide was detected in all ground water samples at concentrations above the 17 µg/L detection limit: 520J µg/L in sample 201, 27J µg/L in sample 202, 590J µg/L in sample 203, and 1,600J µg/L in sample 204. Cyanide was not detected in the background sample.

7.4 SURFACE WATER AND SEDIMENT SAMPLES

Surface water and sediment was sampled at three locations downgradient of the site. Additionally, the East St. Louis raw water intake, located across the Mississippi River from the site was sampled

Table 7-2
PAHs and Cyanide in Subsurface Soil Samples
and Product Sample
Laclede Coal Gas Site
St. Louis, Missouri
E & E/FIT; March 1991
Sample Series DSX44
(mg/kg)

Compound	(2-7') 001*	(7-11') 002*	(11-15') 003*	(17-21') 004*	(19-23') 005*	(3-8') 006	(8-13') 007	(8-12') 008	(4-8') 009	(12-14') 010	(11-17') 011	(5-11') 012	(11-12.5') 013	501
Naphthalene	--	0.40U	--	--	--	23	87	2200	68	0.89	30	--	55	700
2-methylnaphthalene	--	0.40U	--	--	--	80	43	69	84	0.98	23	--	--	4000
2-chloronapththalene	--	0.40U	--	--	--	--	--	--	--	--	--	--	--	450
Acenaphthylene	--	0.40U	--	--	--	--	--	15	--	--	20	--	--	450
Acenaphtene	--	0.40U	--	--	--	--	--	32	12	0.15	15	--	22	620
Fluorene	--	0.40U	--	--	--	20	--	J	13	0.17	24	--	21	830
Phenanthrene	1.4	0.40U	--	--	--	63	20	J	46	0.51	71	--	59	4300
Anthracene	0.38	0.40U	--	--	--	--	--	J	--	--	23	--	18	810
Fluoranthene	2.0	0.52	0.54	--	--	--	--	--	--	--	180	--	39	620
Pyrene	2.8	0.53	0.80	--	--	48	J	J	J	J	J	--	65	2800
Benzo(a)anthracene	1.8	0.40U	--	--	--	18	--	J	--	--	99	--	21	1600
Chrysene	1.8	0.40U	0.44	--	--	18	--	J	16	0.18	94	--	21	2700
Benzo(b) fluoranthene	1.6	0.40U	--	--	--	--	--	61	--	--	76	--	15	--
Benzo(k)fluoranthene	1.4	0.40U	--	--	--	--	--	52	--	--	89	--	17	--
Benzo(a)pyrene	1.5	0.40U	--	--	--	--	--	95	--	--	120	--	23	970
Indeno(1,2,3-CD) pyrene	0.93	0.40U	--	--	--	--	--	37	--	--	75	--	--	--
Dibenzo(a,h)anthracene	--	0.40U	--	--	--	--	--	--	--	--	--	--	--	--
Dibenzo(g,h,i)perylene	1.2	0.40U	--	--	--	--	--	44	--	--	88	--	--	--
Total PAH Content	16.8	1.1	1.8	--	--	270	150	2605	239	2.9	1027	--	376	20,850
Cyanide	26	24	--	--	--	87	180	860	--	48	250	170	--	--

* = Background sample
-- = Undetected (U) with detection limit given for background sample 002.
J = Detected, but results are invalid.

Note: See Figure 6-2 for sample locations and Appendix D for complete analytical results.

(304 and 304D). The most upgradient of these samples (302 and 402) generally exhibited the most contamination, though concentrations are fairly comparable (Tables 7-3 and 7-4). An exception is total chromium (12-14 μg/L), lead (15-18 μg/L), and zinc (46-54 μg/L) detected in samples 304 and 304D, collected from the surface water intake. These metals were not detected in the dissolved fraction of these samples. The only organics deteced in these samples are relatively low levels of PAHs and cyanide found in the sediment samples (Table 7-4). A background sediment and surface water sample was not collected, so that no comparisonn to background can be made for these metals. However, sample concentrations are relatively low as compared to other samples collected.

7.5 PRODUCT SAMPLE

The oil sample (501) collected from an 80,000-gallon tank (Figure 2-3, tank #7) contained significant concentrations of many PAHs (Table 7-2). Attribution of PAH contamination on site is very difficult to assess, based on the fact that in 1986, PF & T experienced a spill of the same oil (#6) which was sampled, over the entire site. It was also common practice for FMGPs to bury their tar wastes on site. PAHs are a major constitudent of coal tar wastes. Thus, surface and subsurface soil PAH contamination could be attributable to either PF & T activities or the FMGP.

Table 7-3
Selected Total Metals
Sediment and Surface Water Samples
Laclede Coal Gas Site
St. Louis, Missouri
E & E/FIT; March 1991
Sample Series DSX44

Sample #	As	Ba	Cu	Cr	Ni	Pb	Se	V	Zn
				Sediment Samples (mg/kg)					
401	3.7	140	9.1	8.7	10	30J	--.--	15	35J
401D	4.0	140	8.2	9.0	11	13J	--.--	17	36J
402	8.4	160	26	16	18	36J	2.0J	27	77J
403	7.1	160	23	12	16	31J	--.--	25	64J
				Water Samples (μg/L)					
301	--.--	--.--	--.--	--.--	--.--	7.0	--.--	--.--	--.--
301D	--.--	--.--	--.--	--.--	--.--	7.2	--.--	--.--	--.--
302	--.--	--.--	--.--	--.--	--.--	9.7	--.--	--.--	--.--
303	--.--	280	--.--	--.--	--.--	24U	I*	62	89U
304	--.--	--.--	--.--	14	--.--	18	--.--	--.--	54
304D	--.--	--.--	--.--	12	--.--	15	--.--	--.--	--.--

* = Invalid analysis, but 11 μg/L dissolved selenium was detected in this sample.
U = Undetected; detection limit given if above detected values.
J = Results are reported, but invalid by approved QC procedures.

Note: See Figure 6-2 for sample locations and Appendix D for complete analytical results.

Table 7-4
PAHs, Cyanide, and Total Hydrocarbons
Sediment Samples
Laclede Coal Gas Site
St. Louis, Missouri
E & E/FIT; March 1991
Sample Series DSX44

(µg/kg)	401	401D	402	403
Phenanthene	---	---	2900	4400
Fluoranthene	---	750	5000	5100
Pyrene	---	960	8000	6400J
Benzo(a)anthracene	---	460	3500	4200
Di-n-octyl phthalate	--	470	3900	4900
Benzo(k)fluoranthene	---	---	2900	3100
Benzo(a)pyrene	---	430	2600	5600
Benzo(GHI)perylene	---	---	3500	4100
Cyanide	---	---	1600	---
Total hydrocarbons	3100	3100U	8200	4900

J = Results are reported, but invalid by approved QC procedures.
U = Undetected, vith detection limit given.
--- Indicated undetected vith detection limits belov detected values.

Note: See Figure 6-2 for sample locations and Appendix D for complete analytical results.

APPENDIX B

ANALYTICAL SERVICES REQUEST FORM

USEPA Region VII Analytical Services Request (ASR) Form

Activity No.: DC1CY | Date: January 23, 1996

Site Name, City, State: Mound Street PCB Site

EPA Project Manager: Dave Crawford

Section/Branch: Region VII / Superfund | Phone No.: 913-551-7702

Contractor Contact: Michael McCurdy | Phone No.: 913-663-2108

Contractor: Sverdrup Corporation, Inc.

Project Sample Delivery Date: March 21, 1995

Funding Program Element: Superfund

Request Summary:

No. Of Samples	Matrix	Group/Parameter Name	Group/Parameter MGP Code
8	Soil	PCB, Vol, Semi-vol	S16, SV, SS
6	Water	PCB, Vol, Semi-vol	W26, WV, WS
1	Water	PCB, Vol, Semi-vol (rinsate)	W26, WV, WS

Use additional pages for clarification

Levels Of Interest Are Specified (mark one): In The QA Document - ■ or On The Back - ☐

Special Requirements or Comments:

Request standard 8 week analytical turnaround

NOTE: Submit This Form To RQAM/ENSV 30 Days Before Sample Delivery

Approvals:

EPA Project Manager (Date) EPA Project Manager (Date)

The Following Is Completed By ENSV Personnel ONLY

QA Document: ☐-Generic QAPP ☐-Site Specific QAPP ☐-Other:

Concurrence:

RQAM: Comment:

Chief, LABO: Comment:

Laboratory Assignment:

- ☐-Region VII
- ☐-ESAT
- ☐-CLP
- ☐-RECAP
- ☐-Other

Schedule Completion:

☐-Routine:
- Non-CLP = 4 weeks
- CLP = 8 weeks

☐-Other:

Date:

Distribution:

- ■ EPA Project Manager
- ■ Chief, LABO/ENSV
  - ☐ Chief, GNAN/LABO
  - ☐ Chief, ORGN/LABO
  - ■ Chief, CLPM/LABO
    - ■ Data Coordinator
    - ■ RSCC
  - ☐ Other:

(Revised February 1993)

Levels Of Interest
(Use Additional Copies of this Form as Needed)

Activity No.: DC1CY

Site Name: Mound Street PCB Site, St. Louis, Missouri

Individual Parameter	Matrix	Concentration Level Of Interest	Units

USEPA Region VII Sampling Supplies Request (SSR) Form

Activity No.: DC1CY

Site Name: Mound Street PCB Site, St. Louis, Missouri

Contact Name: Michael McCurdy -- Sverdrup Corporation

Telephone No.: 913-663-2108

Date equipment to be Picked Up: March 15, 1996

ITEM DESCRIPTION	AMOUNT NEEDED
SAMPLE CONTAINERS:	
4-oz (100 ml) Plastic Bottles	
1-Liter Plastic Cubitainer	
4-Liter Plastic Cubitainer	
8-Liter Plastic Cubitainer	
20-Liter Plastic Cubitainer	
40-ml Glass Vials (Routine - 2 ea. in 1-liter cubitainer with charcoal thimble)	16
40-ml Glass Vials (Low DL - 4 ea. in 1-liter cubitainer with charcoal thimble)	
8-oz. (250 ml) Wide-Mouth Glass Jar	22
32-oz. (1 Liter) Wide-Mouth Glass Jar	
8-oz. (250 ml) Amber Glass Bottle	
80-oz (2.5 Liter) Amber Glass Bottle	12
4-Liter Amber Glass Bottle	
SAMPLING SUPPLIES:	
Sampling Spoons	10
Aluminum Pans	10
1-qt. (1 Liter) Metal Paint Can (with Vermiculite®)	
1-gal. (4 Liter) Metal Paint Can (with Vermiculite®)	
Other:	
PRESERVATIVES: (return preservative containers to the laboratory)	
HCl (1:1)	1
HNO_3 (1:1)	1
H_2SO_4 (Concentrated)	
NaOH (Pellets)	
Other:	
SHIPPING SUPPLIES:	
Large Plastic Bags (ice chest liners)	4
Ice Chests	4
Fiber tape (by roll)	1
Custody-Seal Tape (by piece, not roll)	16
Chain-Of-Custody Forms	6
Storage Bags for Chain-Of-Custody Forms	6
Foam Packing	4 coolers worth
QUALITY CONTROL SAMPLES:	1
Water Trip Blank (VOA only)	
Soil Trip Blank (VOA only)	1

Performance Evaluation (PE) Samples:

Number Of Samples	Matrix	Target Analytes	Desired Concentration Range

ADDITIONAL SUPPLIES

APPENDIX C

SVERDRUP/CDM FEDERAL
SUBSURFACE SOIL SAMPLING
SOP 1-4

SUBSURFACE SOIL SAMPLING

Prepared: [signature] 9/20/93 Signature/Date
Technical Review: [signature] 9-20-93 Signature/Date
QA Review: [signature] 9/20/93 Signature/Date
Approved: [signature] 9/24/93 Signature/Date
Issued: [signature] 9/27/93 Signature/Date

1.0 OBJECTIVE

The objective of this standard operating procedure (SOP) is to define the techniques and requirements for collecting soil samples from the unconsolidated zone. Techniques include use of hand augers, Shelby tubes, and split-spoon samplers.

2.0 BACKGROUND

2.1 Definitions

Unconsolidated Zone - The layer of soil above bedrock that exists in a relatively loose state.

Hand Auger - A stainless steel cylinder (bucket) approximately 3 to 4 inches in diameter and one foot in length, open at both ends with the bottom edge designed to twist into the soil and cut out a soil core. The bucket collects the soil sample. The auger has a T-shaped handle (for hand operation) attached to the top of the bucket by extendable stainless steel rod(s).

Shelby Tube - A cylindrical sampling device, generally made of steel, which is driven into the subsurface soil through the hollow-stem auger. The tube, once retrieved, may be capped and the undisturbed soil sample extruded in the laboratory prior to analysis.

Split-Spoon - A cylindrical sampling device, generally made of carbon steel, which fits into a hollow stem auger. The spoon is hinged lengthwise, which allows the sample to be retrieved by opening ("splitting") the spoon.

Subsurface Soil - The soil which exists deeper than approximately 1 foot (30 cm) from the surface, but above bedrock or any other consolidated material.

Grab Sample - A discrete portion or aliquot taken from a specific location at a given point in time.

Liner - A cylindrical sampling device, generally made of brass, stainless steel, or Teflon, that is placed inside a split-spoon or hand auger bucket to collect soil samples.

Composite Sample - Two or more subsamples taken from a specific media and site at a specific point in time. The subsamples are collected and mixed, then a single average sample is taken from the mixture.

Auger Flight - A steel section length attached to an auger to extend the auger as coring depth increases.

2.2 Discussion

Shallow subsurface soil samples (to depths between 1 and 10 feet) may be collected using hand augers. However, soil samples collected with a hand auger are commonly of poorer quality than those collected by split-spoon or Shelby tube samplers since the soil sample is disturbed in the augering process. Split-spoon and Shelby tube liners may be used to prevent loss of volatile organic compounds (VOCs). The size and construction material of sampling devices should be selected based on project and analytical objectives and defined in site-specific plans.

2.3 Associated Procedures

- CDM Federal SOP 1-2, Sample Custody
- CDM Federal SOP 2-5, Packaging and Shipping of Environmental Samples
- CDM Federal SOP 3-5, Lithologic Logging
- CDM Federal SOP 4-5, Field Equipment Decontamination at Nonradioactive Sites

3.0 RESPONSIBILITIES

Site Manager - The Site Manager is responsible for ensuring that field personnel are trained in the use of this procedure and the required equipment, and for ensuring that subsurface soil samples are collected in accordance with this procedure and any other SOPs pertaining to specific media sampling.

Field Team Leader - The Field Team Leader is responsible for ensuring that field personnel collect subsurface soil samples in accordance with this SOP and other relevant procedures.

4.0 REQUIRED EQUIPMENT

4.1 General

- Site-specific plans
- Field logbook
- Indelible black ink pens and markers
- Labels and appropriate forms/documentation for sample shipment
- Clear, waterproof tape
- Appropriate sample containers
- Insulated cooler(s) and waterproof sealing tape
- Ice bags or "blue ice"
- Latex or appropriate gloves
- Plastic zip-top bags
- Personal protective clothing and equipment
- Stainless steel and/or Teflon-lined spatulas and pans, trays, or bowls
- Plastic sheeting

4.2 Manual (Hand) Augering

- Hand auger: flighted-, bucket-, or tube-type auger as required by the site-specific plans
- Extension rods, as needed
- Wrench(es), pliers

4.3 Split-Spoon and Shelby Tube Sampling

- Drill rig equipped with a 140-lb drop hammer and sufficient hollow-stem augers to drill to the depths required by the site-specific plans
- Sufficient numbers of split-spoon or Shelby tube samplers so that at least one is always decontaminated and available for sampling. Three split-spoon or Shelby tube samplers are generally the minimum necessary. (Shelby tubes are usually used only once.)
- Split-spoon liners, as appropriate
- Wrench(es), hammer

5.0 PROCEDURES

5.1 Preparation

1. Don the appropriate personal protective clothing as dictated by the site-specific health and safety plan.

2. The collection points shall be stated, located on a site map, and referenced in the field logbook.

3. Processes for verifying depth of sampling must be specified in the site-specific plans.

4. Clear away vegetation and debris from the surface at the boring location.

5. Prepare an area next to the sample collection location for laying out cuttings by placing plastic sheeting on the ground or over a work area.

6. Set up a decontamination line, if decontamination is required. See CDM Federal SOP 4-5.

5.2 Collection

The following general steps must be followed when collecting all subsurface soil samples:

1. VOC samples or samples degraded by aeration shall be collected first and with the least disturbance possible. These samples shall be collected as grab samples.

2. Sampling information shall be recorded in the field logbook and on any associated forms. Describe lithology, according to CDM Federal SOP 3-5, in the field logbook or on the Lithologic Log Form.

3. Specific sampling devices to be used shall be identified in the site-specific plans.

4. Care must be taken to prevent cross-contamination and misidentification of samples.

5. Processes for verifying depth of sampling must be specified in the site-specific plans.

6. Sample bottles for VOC analysis should be filled completely to minimize headspace.

5.2.1 Manual (Hand) Augering

The following steps must be followed when collecting hand-augered samples:

1. Auger to the depth required for sampling. Place cuttings on plastic sheeting or as specified in the site-specific plans. If possible, lay out the cuttings in stratigraphic order.

2. Throughout the augering, make detailed notes concerning the geologic features of the soil or sediments in the field logbook.

3. Cease augering when the top of the specified sampling depth has been reached. If required, remove the auger from the hole and decontaminate the auger or use a fresh auger. Then obtain the sample.

4. Collect a grab sample for VOC analyses (or samples that may be degraded by aeration) immediately and place in sample container. Sample bottles should be filled completely to minimize headspace.

5. Label the sample container with the appropriate information. Secure the label, covering it with a piece of clear tape.

6. Remaining sample should be homogenized for other analyses prior to placing samples in the appropriate containers. Label containers as required.

7. Wipe containers clean with a clean Kimwipe or paper towel.

8. Place the containers in zip-top plastic bags and seal the bags. Pack samples in a chilled cooler.

9. Proceed with further sampling, as required by the site-specific plans.

10. When all sampling is complete, dispose of cuttings, plastic sheeting, etc., as specified in the site-specific plans.

11. Complete the field logbook entry and other appropriate forms, being sure to record all relevant information before leaving the site.

12. Properly package all samples for shipment and complete all necessary sample shipment documentation. Transfer custody of samples to the appropriate personnel. See CDM Federal SOPs 1-2 and 2-5 or site-specific plans.

5.2.2 Manual (Hand) Augering Using a Tube Sampler With Liner

The following steps must be followed when collecting hand-augered samples using a tube sampler with liner:

1. Auger to the depth required for sampling. Place cuttings on the plastic sheeting as specified in the site-specific plans. If possible, lay out the cuttings in stratigraphic order.

2. Throughout augering, make detailed notes concerning the geologic features of the soil or sediments in the field logbook.

3. Cease augering when the top of the specified sampling depth has been reached. Remove the auger from the hole and decontaminate.

4. Prepare a decontaminated tube sampler by installing a decontaminated liner in the auger tube.

5. Obtain the sample and retrieve the auger. Remove the liner from the tube and immediately cover ends with Teflon tape and cap the ends of the tube. Seal the caps with waterproof tape.

6. Label the sealed liners as required in the site-specific plans. Mark the top and bottom of the sample on the outside of the liner. Indicate boring/well number and depth on outside of liner.

7. Wipe sealed liners clean with a clean Kimwipe or paper towel.

8. Place sealed liners in zip-top plastic bags and seal the bags. Pack samples in a chilled cooler.

9. Proceed with further sampling, as required by the site-specific plans.

10. When sampling is complete, dispose of cuttings, plastic sheeting, etc., as specified in the site-specific plans.

11. Decontaminate all equipment according to CDM Federal SOP 4-5.

12. Complete the field logbook entry and other forms, being sure to record all relevant information before leaving the site.

13. Properly package all samples for shipment and complete all necessary sample shipment documentation. Transfer custody of samples to the appropriate personnel. See CDM Federal SOPs 1-2 and 2-5 or site-specific plans.

5.2.3 Split-Spoon Sampling

The following steps must be followed when collecting split-spoon samples:

1. Remove any pavement and subbase material from an area of twice the bit diameter, if necessary.

2. The drilling rig will be decontaminated at a separate location prior to drilling, per CDM Federal SOP 4-5 or the site-specific decontamination procedures.

3. Attach to the drill rig the hollow-stem auger with the cutting head, plug and center rod(s).

4. Begin drilling and proceed to the first designated sample depth, adding auger flight(s) as necessary.

5. Remove the plug and center rods.

6. Install a decontaminated split-spoon on the center rod(s) and insert it into the hollow-stem auger. Connect the hammer assembly and lightly tap the rods to seat the drive shoe at the top of undisturbed soil or sediment.

7. Mark the center rod in 6-inch increments from the top of the auger flight(s).

8. Drive the spoon using the hammer. Use a full 30-inch drop as specified by the American Society for Testing and Materials (ASTM) Method D-1586. Record the number of blows required to drive the spoon through each 6-inch increment.

9. Cease driving when the full length of the spoon has been driven or upon refusal. Refusal occurs when little (< 1 inch) or no progress is made for 50 blows of the hammer.

10. Pull the spoon or tube free by using upswings of the hammer to loosen the sampler. Pull out the center rod and spoon.

11. Unscrew the split-spoon assembly from the center rod and place it on the plastic sheeting.

12. Remove the drive shoe and head assembly. If necessary, tap the split-spoon assembly with a hammer to loosen threaded couplings.

13. With the drive shoe and head assembly off, open (split) the spoon, being careful not to disturb the sample.

14. Label sample containers with appropriate information. Secure the label, covering it with a piece of clear tape.

15. If VOC analyses are to be conducted on the soil sample, place that sample in its sample container immediately after opening the spoon, filling the sample bottle completely. Seal the container immediately, then describe it in the field logbook and/or associated forms. Record the sample identification number, depth from which the sample was taken, and the analyses to be performed on the samples in the field logbook and on the appropriate forms.

16. Remaining sample should be homogenized prior to placing samples in appropriate containers. Label containers as required.

17. Wipe containers clean with a clean Kimwipe or paper towel.

18. Place containers in zip-top plastic bags and seal the bags. Pack samples in a chilled cooler.

19. Continue to advance the borehole to the next sampling point. Collect samples as outlined above.

20. When sampling is complete, remove the drilling rig to the heavy equipment decontamination area.

21. Dispose of cuttings, plastic sheeting, etc., as specified in the site-specific plans.

22. Decontaminate split-spoons and other small sampling equipment according to CDM Federal SOP 4-5 before proceeding to other sampling locations.

23. Complete the field logbook entry and other forms, being sure to record all relevant information before leaving the site.

24. Properly package all samples for shipment to laboratories and complete all necessary sample shipment documentation. Transfer custody of the samples to the appropriate personnel. See CDM Federal SOPs 1-2 and 2-5 or site-specific plans.

5.2.4 Split-Spoon Sampling Using Liners

The following steps must be followed when collecting samples with lined split spoons:

1. Remove any pavement and subbase material from an area of twice the bit diameter, if necessary.

2. The drilling rig will be decontaminated at a separate location prior to drilling.

3. Attach the hollow-stem auger with the cutting head and center rod(s).

4. Begin drilling and proceed to the first designated sample depth, adding auger flight(s) as necessary.

5. Remove the plug and center rods.

6. Install decontaminated liners in the split-spoon barrel.

7. Install a decontaminated split spoon on the center rod(s) and insert it into the hollow-stem auger. Connect the hammer assembly and lightly tap the rods to seat the drive shoe at the top of undisturbed soil or sediment.

8. Mark the center rod in 6-inch increments from the top of the auger flight(s).

9. Drive the spoon using the hammer. Use a full 30-inch drop as specified by ASTM Method D-1586. Record the number of blows required to drive the spoon through each 6-inch increment.

10. Cease driving when the full length of the spoon has been driven or upon refusal. Refusal occurs when little (< 1 inch) or no progress is made after 50 blows of the hammer.

11. Pull the spoon or tube free by using upswings of the hammer to loosen the sampler. Pull out the center rod and spoon.

12. Unscrew the split-spoon assembly from the center rod and place it on the plastic sheeting.

13. Remove the drive shoe and head assembly. If necessary, tap the split-spoon assembly with a hammer to loosen threaded couplings.

14. With the drive shoe and head assembly off, open (split) the spoon and remove the liners without disturbing the sample.

15. Immediately install Teflon tape over the ends of the liners, cap the liners, and seal the caps over the ends of the liner with waterproof tape. Label the samples as required by the site-specific plans. Mark the top and bottom of the sample on the outside of the liner. Indicate boring/well number and depth on outside of liner.

16. Wipe sealed liners clean with a clean Kimwipe or paper towel.

17. Place sealed liners in zip-top plastic bags and seal the bags. Pack samples in a chilled cooler.

18. In the field logbook and on the boring log, describe sample lithology by observing cuttings and the bottom end of the sample in the liner.

19. Continue to advance the borehole to the next sampling point. Collect samples as outlined above.

20. When sampling is complete, remove the drilling rig to the heavy equipment decontamination site.

21. Dispose of cuttings, plastic sheeting, etc., as specified in the site-specific plans.

22. Decontaminate split spoons and other small sampling equipment before proceeding to other sampling locations as required by the CDM Federal SOP 4-5.

23. Complete the field logbook entry, and other forms, being sure to record all relevant information before leaving the site.

24. Properly package all samples for shipment to laboratories and complete all necessary sample shipment documentation. Transfer custody of the samples to the appropriate personnel. See CDM Federal SOPs 1-2 and 2-5 or site-specific plans.

5.2.5 Shelby Tube Sampling

The following steps must be followed when collecting samples using the Shelby tube:

1. Remove any pavement and subbase material from an area of twice the bit diameter. if necessary.

2. The drilling rig will be decontaminated at a separate location prior to drilling.

3. Attach the hollow-stem auger with the cutting head, plug, and center rod(s).

4. Begin drilling and proceed to the first designated sample depth, adding auger flight(s) as necessary.

5. Slightly raise the auger flight(s) to disengage the cutting head, and rotate the auger without advancement to clean cuttings from the bottom of the hole.

6. Remove the plug and center rods.

7. Attach a head assembly to a decontaminated Shelby tube. Attach the Shelby tube assembly to the center rods.

8. Lower the Shelby tube and center rods into the hollow-stem augers and seat it at the bottom. Be sure to leave 30 inches or more of center rod above the lowest point to the hydraulic piston's extension.

9. Use the rig's hydraulic drive to push the Shelby tube into undisturbed soil. The tube should be pushed with a steady force.

10. When the Shelby tube has been advanced its full length or to refusal, back off the hydraulic pistons. Attach a hoisting plug to the upper end of the center rod, twist to break off the sample, and pull the apparatus out of the hole with the rig winch.

11. Retrieve the Shelby tube to the surface, detach it from the center rod, and remove the head assembly.

12. Since the typical intent of Shelby tube sampling is for engineering purposes and an undisturbed sample is required the tube ends should be sealed immediately, the top and bottom ends of the tube marked, and the tube should be transported to the laboratory in an upright position. Indicate boring/well number and depth on outside of liner.

13. Wipe sealed tubes clean with a clean Kimwipe or paper towel.

14. Place sealed tubes in zip-top plastic bags and seal bags. Pack samples in a chilled cooler.

15. Continue to advance the borehole to the next sampling point. Collect samples as outlined above.

16. When sampling is complete, remove the drilling rig to the heavy equipment decontamination area.

17. Dispose of cuttings, plastic sheeting, etc., as specified in the site-specific plans.

18. Complete the field logbook entry, being sure to record all relevant information before leaving the site.

6.0 RESTRICTIONS/LIMITATIONS

Basket or spring retainers may be needed for split-spoon sampling in loose, sandy soils.

Shelby tubes may not retain the sample in loose, sandy soils.

7.0 REFERENCES

American Society for Testing and Materials, *Penetration Test And Split Barrel Sampling Of Soils*, Standard Method D-1586-84, 1984.

U.S. Department of Energy, Hazardous Waste Remedial Actions Program, *Quality Control Requirements For Field Methods*, DOE/HWP-69/R1, July 1990.

U.S. Department of Energy, Hazardous Waste Remedial Actions Program, *Standard Operating Procedures For Site Characterizations*, DOE/HWP-100, July 1990.

APPENDIX D

SVERDRUP/CDM FEDERAL
FIELD EQUIPMENT FIELD DECONTAMINATION
AT NON-RADIOACTIVE SITES
SOP 4-5

FIELD EQUIPMENT DECONTAMINATION AT NONRADIOACTIVE SITES

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1.0 OBJECTIVE

The objective of this standard operating procedure (SOP) is to describe the procedures required for decontamination of field equipment.

2.0 BACKGROUND

2.1 Definitions

Clean - Free of visible contamination and when decontamination has been completed in accordance with this SOP.

Cross-Contamination - The transfer of contaminants through equipment or personnel from the contamination source to less contaminated or noncontaminated samples or areas.

Decontamination - The process of rinsing or otherwise cleaning the surfaces of equipment to rid them of contaminants and to minimize the potential for cross contamination of samples or exposure of personnel.

2.2 Discussion

Decontamination of field equipment is necessary to ensure the quality of samples by preventing cross contamination. Further, decontamination reduces health hazards and prevents the spread of contaminants off-site.

3.0 RESPONSIBILITIES

Field Team Leader - The Field Team Leader (FTL) ensures that field personnel are trained in the performance of this procedure and that decontamination is conducted in accordance with this procedure. The FTL may also be required to collect and document rinseate samples to provide quantitative verification that these procedures have been correctly implemented.

4.0 REQUIRED EQUIPMENT

- High-pressure pump with soap dispenser or steam-spray unit (for large equipment only)
- Stiff-bristle scrub brushes
- 55-gallon drums
- Plastic buckets and troughs
- Laboratory-grade detergent (low phosphate)
- Nalgene or Teflon Sprayers or wash bottles or 2- to 5-gallon, manual-pump sprayer (pump sprayer material must be compatible with the solution used)
- Plastic sheeting
- Disposable wipes or rags
- Water, American Society for Testing and Materials (ASTM) type II or better, as defined by ASTM Standard Specification for Reagent Water, Standard D 1193-77 (reapproved 1983)
- Appropriate decontamination solutions pesticide grade or better and traceable to a source (e.g. 10% and/or 1% nitric acid (HNO_3), acetone, methanol, isopropanol, hexane)
- Gloves, safety glasses, and other protective clothing as specified in the site-specific health and safety plan

5.0 PROCEDURES

All reusable equipment (non-dedicated) used to collect, handle. or measure samples will be decontaminated before coming into contact with any sample. Decontamination of equipment will occur either at the central decontamination station or at portable decontamination stations set up at the sampling location, drill sites, or monitoring well locations. The centrally located decontamination station will include a pad on which the drill rigs and other large drilling equipment, such as auger flights, can be steam cleaned.

The decontamination pad will be constructed so that contaminated water drains into a collection system. Collected water will be pumped into 55-gallon drums or portable tanks for storage and, if necessary, treated before discharge to an onsite industrial waste treatment plant (IWTP) or manifested off site by a waste hauler if required. The water will be collected and the appropriate method of disposal will be determined. Also, decontamination fluids, such as solvents may need to be segregated from other investigation derived wastes. Disposal alternatives will be specified in the site-specific plans.

All items that will come into contact with potentially contaminated media will be decontaminated before use and between sampling and/or drilling locations. If decontaminated items are not immediately used, they will be covered either with plastic or aluminum foil depending on the size of the item. All decontamination procedures for the equipment being used are as follows:

General Guidelines

- Potable water will be of a known quality. Water from untested sources that may contain contaminants will not be used.

- Soap used in the soap and water rinse step will be a low phosphate detergent.

- Sampling equipment that has come into contact with oil and grease will be cleaned with methanol or other approved alternative to remove the oily material. This may be followed by a hexane rinse and then another methanol rinse. Check with regional or client requirements.

- Decontaminated equipment will be allowed tc air dry before being used.

- Documentation for all cleaning will be recorded in the appropriate logbook.

- All solvents will be pesticide grade or better and traceable to a source. The corresponding lot numbers will be recorded in the appropriate logbook.

- Gloves, boots, safety glasses, and any other personnel protective clothing and equipment will be uses as specified in the site-specific health and safety plan.

5.1 Heavy Equipment Decontamination

Heavy equipment includes drilling rigs and backhoes. Follow these steps when decontaminating this equipment:

1. Set up a decontamination pad that is large enough to fully contain the equipment to be cleaned. Use one or more layers of heavy plastic sheeting to cover the ground surface. All decontamination pads should be upwind of the area to be investigated.

2. With the rig in place, spray areas (rear of rig or backhoe) exposed to contaminated soils using a steam or a high-pressure sprayer. Be sure to spray down all surfaces, including the undercarriage. It is also good practice to clean the motor, hydraulic lift, oil fill, and fuel tank areas to avoid introducing contaminants to the work site.

3. Use brushes, and low phosphate detergent and potable water to remove dirt whenever necessary.

4. Remove equipment from the decontamination pad and allow it to air dry before returning it to the work site.

5. Record equipment type, date, time, and method of decontamination in the appropriate logbook.

6. After decontamination activities are completed, collect all contaminated waste waters, plastic sheeting, and disposable gloves, boots, and clothing in separate containers or receptacles. All receptacles containing contaminated items must be properly labeled for disposal. Liquids and solids must be drummed separately.

5.2 Downhole Equipment Decontamination

Downhole equipment decontamination includes hollow-stem augers, drill pipes, casings, screens, etc. Follow these steps when decontaminating this equipment:

1. Set up a centralized decontamination area, if possible. This area should be set up to contain contaminated rinse waters and to minimize the spread of airborne spray.

2. Set up a "clean" area upwind of the decontamination area to receive cleaned equipment for air drying. At a minimum, clean plastic sheeting must be used to cover the ground, tables, or other surfaces on which decontaminated equipment is to be placed. All decontamination pads should be upwind of the area to be investigated.

3. Place the object to be cleaned on aluminum foil or plastic-covered wooden sawhorses or other supports.

4. Using low phosphate detergent and potable water in the high-pressure sprayer (or steam unit), spray the contaminated equipment. Aim downward to avoid spraying outside the decontamination area. Be sure to spray inside corners and gaps especially well. Use a brush, if necessary, to dislodge dirt.

5. If using soapy water, rinse the equipment using clean, potable water. If using steam, the rinse step is not necessary if the steam does not contain a detergent. If the steam contains a detergent, this final clean water rinse is required.

6. Using the manual-pump sprayer, rinse the equipment thoroughly with water (ASTM Type II or better).

7. Remove the equipment from the decontamination area and place in the clean area to air dry.

8. Record equipment type, date, time, and method of decontamination in the appropriate logbook.

9. After decontamination activities are completed, collect all contaminated waste waters, plastic sheeting, and disposable gloves, boots, and clothing in separate containers or receptacles. All receptacles containing contaminated items must be properly labeled for disposal. Liquids and solids must be drummed separately.

5.3 Sampling Equipment Decontamination

Sampling equipment includes split spoons, spatulas, and bowls used for sample homogenization that directly contact sample media. Follow these steps when decontaminating this equipment:

1. Set up a decontamination line on plastic sheeting. The decontamination line should progress from "dirty" to "clean" and end with an area for drying decontaminated equipment. At a minimum, clean plastic sheeting must be used to cover the ground, tables, or the surfaces on which decontaminated equipment is to be placed.

2. Before washing, disassemble any items that might trap contaminants internally. Do not reassemble these items until decontamination is complete. Wash items thoroughly in a bucket of low phosphate detergent and potable water. Use a stiff-bristle brush to dislodge any clinging dirt.

3. Rinse the item in potable water. Rinse water should be replaced as needed, generally when cloudy.

4. Using a hand sprayer, wash bottles, or manual-pump sprayer, rinse the item with water (ASTM Type II or better).

5. If required by the site-specific plans, rinse the item with 10% nitric acid (for stainless steel, glass, plastic, and Teflon), or 1% nitric acid (for items made of low-carbon steel) followed by a water (ASTM Type II or better) rinse.

   NOTE: Care should be taken not to get nitric acid on skin or clothing. This step should not be used unless required by sampling needs.

   CAUTION: Do not allow nitric acid to contact methanol or hexane. Contain nitric acid waste separate from organic solvents.

6. If sampling for organic analytes, rinse the item with methanol or approved organic solvent.

7. Rinse the item with water (ASTM Type II or better).

8. If polar organic compounds such as pesticides, polychlorinated biphenyls (PCBs), and fuels are to be sampled, rinse the item with hexane or approved alternatives, followed by a second methanol rinse. This step should not be used unless required by sampling needs.

9. Allow the item to air dry completely.

10. After drying, wrap the clean item in plastic wrap or in aluminum foil, shiny side out.

11. Record equipment type, date, time, and method of decontamination in the appropriate logbook.

12. After decontamination activities are completed, collect all contaminated waters, used solvents and acids, plastic sheeting, and disposable gloves, boots, and clothing. Place contaminated items in properly labeled drums for disposal. Liquids and solids must be drummed separately. (Refer to site-specific plans for waste management requirements).

5.4 Pump Decontamination

Follow these steps when decontaminating pumps:

1. Set up the decontamination area and separate "clean" storage area using plastic sheeting to cover the ground, tables, and other porous surfaces. Set up three 55-gallon drums in a triangle. The two drums at the base of the triangle will be used to contain dilute (nonfoaming) soapy water and potable water. The drum at the apex will receive waste water. Place containers of water (ASTM Type II or better) adjacent to the waste drum on the same side as the potable water drum.

2. The pump should be set up in the same configuration as for sampling. Submerge the pump intake (or the pump, if submersible) and all downhole-wetted parts (tubing, piping, foot valve) in the soapy water of the first drum. Place the discharge outlet in the waste drum above the level of the waste water. Pump soapy water through the pump assembly until it discharges to the waste drum.

3. Move the pump assembly to the potable water drum while leaving discharge outlet in the waste drum. All downhole-wetted parts must be immersed in the potable water rinse. Pump potable water through the pump assembly until it runs clear.

4. Move the pump intake to the distilled water can. Pump distilled water through the pump assembly. Usually, three pump-and-line-assembly volumes will be required.

5. Decontaminate the discharge outlet by hand following the steps outlined in Section 5.3.

6. Remove the decontaminated pump assembly to the "clean" area and allow it to air dry. Intake and outlet orifices should be covered with aluminum foil to prevent the entry of airborne contaminants and particles.

7. Record the equipment type, serial number, date, time, and method of decontamination in the appropriate logbook.

5.5 Instrument Probe Decontamination

Instrument probes used for field instruments such as pH meters, conductivity meters etc. will be decontaminated between samples and after use with ASTM type II, or better, water.

5.6 Waste Disposal

Refer to site-specific plans for waste disposal requirements. The following are guidelines for disposing of wastes:

1. All wash water, rinse water, and decontamination solutions that have come in contact with contaminated equipment are to be handled, packaged, labeled, marked, stored, and disposed of as hazardous waste unless other arrangements are approved in advance.

2. Small quantities of decontamination solutions may be allowed to evaporate to dryness.

3. If large quantities of used decontamination solutions will be generated, it may be best to separate each type of waste in a separate container. This may permit the disposal of wash water and rinse water in a sanitary sewage treatment plant rather than as a hazardous waste. If an industrial waste water treatment plant is available onsite, the disposal of acid solutions and solvent-water solutions <u>may</u> be permitted.

4. Unless required, plastic sheeting and disposable protective clothing may be treated as a solid, nonhazardous waste.

6.0 RESTRICTIONS/LIMITATIONS

Nitric acid and polar solvent rinses are necessary only when sampling for metals or organics respectively. These steps should not be used unless required because of acid burn and ignitability hazards.

If the field equipment is not allowed to air dry properly before use, volatile organic residue which interferes with the analysis may be detected in the samples. The occurrence of residual organic solvents is often dependent on the time of year sampling is conducted; in the summer, volatilization is rapid and in the winter, volatilization is slow. Check with your EPA region, state and client for approved decontamination solvents.

7.0 REFERENCES

Department of Energy, Hazardous Waste Remedial Actions Program, *Standard Operating Procedures For Site Characterization*, DOE/HWP-100, July 1990.

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American Society for Testing and Materials, *Standard Practice for Decontamination of Field Equipment at Nonradioactive Waste Sites*, ASTM D5088-90, June 29, 1990.

U.S. Environmental Protection Agency, Region II, "*CERCLA Quality Assurance Manual*, Revision 1, 1989.

U.S. Environmental Protection Agency, Region IV, *Engineering Support Branch Standard Operating Procedures and Quality Assurance Manual*, 1986.

U.S. Environmental Protection Agency, *A Compendium of Superfund Field Operations Methods*, EPA/540/P-87/001.1, 1987.